approach

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On the Cover

A dramatic moment during a successful emergency landing on a foamed runway. An article on this timely subject begins on page 2.

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Letters

Tired Blood Types

Sir:

I suggest to the young 26-year-old lieutenant type who recommends a seven-hour limitation on exercise and training missions that (1) he remove his head from the sand and (2) start taking Geritol. The P2V is built for long-range patrols; to limit such aircraft to flights of seven hours' duration would be inefficient, uneconomical and impossible under wartime conditions.

Having had tours in PBYs and two full tours in P2Vs I do not consider 10-12-hour patrols excessive. As executive officer of a P2V squadron for 27 months operating in such areas as Iceland and Argentia fatigue was never a big factor. Subsequently, as C.O. of the Hurricane Hunters the average length of our hurrico flights was 10 hours.

For the lieutenant's information, my 10-12-hour duration hurricos were being made at the ripe old age of 38!

E. L. FOSTER, CDR

Invitation to Disaster

Sir:

Each time I read that such-and-such a squadron has broken a flight time record I immediately suspect that such-and-such a squadron is inviting disaster. Why?

We've heard about fatigue, and it has been preached to us until many of us are sick of hearing about it. Being sick of a problem does not solve it. In almost every case where a unit far exceeds its average flight time you'll find fatigue involved. More flight time generates more checks, more maintenance work, and the maintenance personnel get tired. Being tired for one or two or three days doesn't hurt; or we can stretch that one or two or three days into a longer time. But there is a limit. The limit is the spot where chronic fatigue sets in. The limit varies from person to person. There are some things we know. When chronic fatigue exists, mistakes will be made; when maintenance crews are tired, maintenance errors will be made; when maintenance errors are made, accidents will be a result. Here then is the point of this whole article: the maintenance crew must exert at least as much (and probably more) effort toward getting out the third and fourth hop per day per pilot as it does toward getting out the first and second.

Does it, then, pay to fly a pilot a fourth hop per day? I can't believe that it is justified. Certainly, by doing so your squadron may break a flight time record. What is that doing to the maintenance crew? Is the record one that represents real training? If it does, well and good. But this brings up another point.

Usually, when a flight time record is broken, it is the result of a considerable amount of "hole boring." Someone sees a chance to break a record, and either a few or possibly all of the flights are ordered to stay aloft as long as possible; so more flights than normal are made at maximum endurance. This procedure makes the utilization figures look good, too. All the paper reports look good. But what has happened to training? I'll not deny that learning should take place at all times, and certainly on a max endurance hop the pilot will learn something. But he can't learn much—except how boring "boring holes" can be.

More power to the units that, with careful consideration of training and fatigue, break flight time records. Few if, indeed, any exist. I'm mighty leary of broken flight time records.

C. A. BROWN, CDR

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Hi-Viz Prop Tips

Sir:

During airship ground handling evolutions and regular engine turn-ups while an airship is docked, ground personnel often perform various functions quite near the propellers.

It is recommended that propeller tips on all airships be painted with color 633, Flourescent Red-Orange (Mil-P-21600 (Aer)) type paint for the safety of personnel.

HOWARD WETTERHALL, AEC
ZP-2, NAS Glynco
Brunswick, Ga.

Bailout, Routine

Sir:

I noted with interest the article "THREE TO GO" in the May 1959 issue of APPROACH. The hangar deck drill was particularly appreciated because of its similarity to the drills conducted by our detachment.

We have manufactured a trainer (see photo) from a surveyed seat chute harness fastened to an H-shaped frame with four 24" by ½" diameter bungees. The use of bungees provides the users with a simulation of opening shock and firmly seats them in the harness.

We have suspended our trainer from an overhead chain fall and the pilots strap in while standing on a platform approximately 10 feet off the deck. An ejection seat is placed on this platform and the pilots simulate the standard ejection procedures and separation when they jump. The chain fall is raised high enough to give about two feet of clearance with the bungees fully stretched out.

In the first attempts to sit back in the harness, a majority of the pilots using our trainer experienced some difficulty, but after a few practice runs, all users feel confident that an actual ejection or bailout will be routine.

V. F. FORSBERG, LCDR
OIC GMGRU 1 ConUS Det

Bouquets

Sir:

Much time and effort has been expended on the safety of the pilot flying modern aircraft. There have been many controversies concerning the merits of various items of equipment. There have been complaints, some constructive criticism and some valuable suggestions from the operators of this equipment.

As a recent ejectee from a burning A4D I would like to heap bouquets on all the people in BuWeps, the Safety Center, the aircraft industry and the prodders in the field who contributed to the present state of the art. My sincere appreciation to all who have devoted so much time and effort for our safety.

CLYDE J. LEE
CO, VA-112

● **The bulk of the credit goes to the people who trained you, kept you trained, and to the capable mechs who maintained your ejection system so it worked when you needed it.**

VOLUME 5 APPROACH—THE NAVAL AVIATION SAFETY REVIEW NUMBER 8

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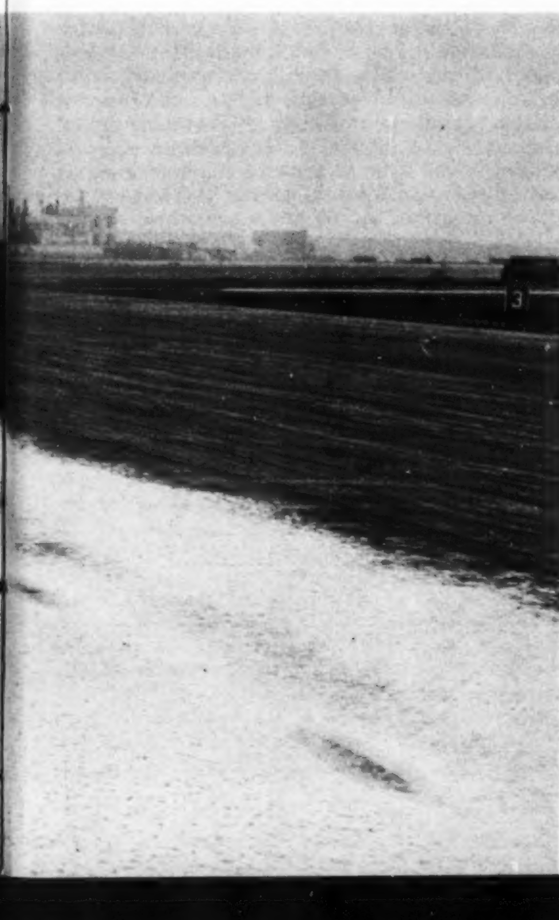
EMERGENCY LANDINGS ON FOAMED RUNWAYS

Guidelines for those in control—in the air and on the ground, when an emergency landing is imminent . . .



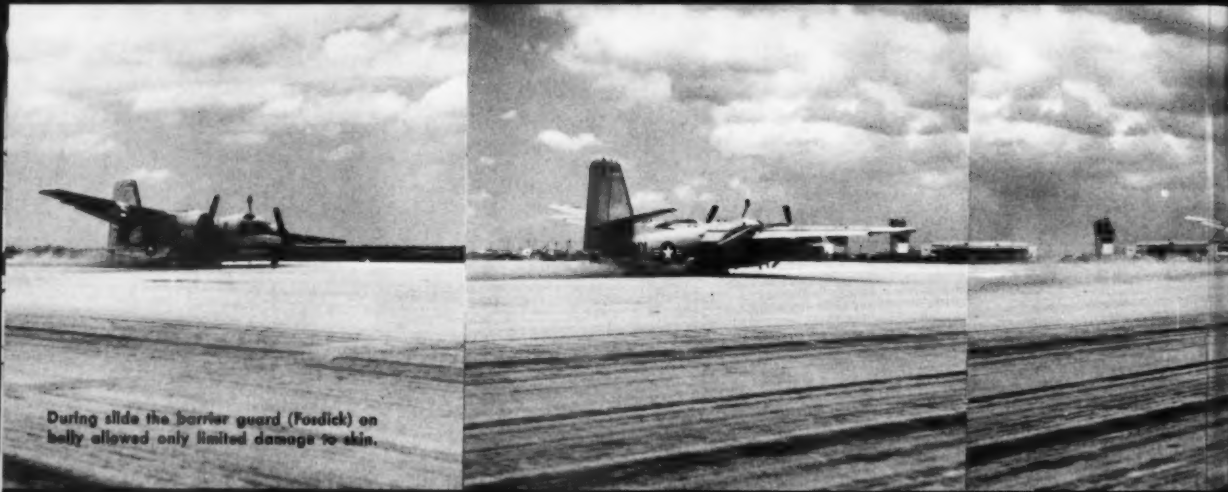
FOR half an hour the jet fighter had circled aimlessly near the air station while the pilot attempted to get his wheels down.

Many people had tried to help. A wingman kept company with the crippled aircraft, ready to report any visible results of the pilot's efforts. In the control tower far below, others checked the aircraft flight manual and handbook of maintenance instructions then used the tower radio to transmit step-by-step emergency methods for lowering the landing gear. Nothing had been successful and now the pilot began to think about his fuel supply.

"Doesn't look like we're going to get the gear down," came his voice over the radio. "Going to have to make a belly landing." He added, "How about laying a strip of foam on the runway?"

With this last sentence—part question, part request—the situation took on a strange new shape. Foam the runway? Now half a dozen questions demanded quick answers; yet the group of men gathered in the tower were silent. Foam, carried in the crash trucks, was developed for fire-fighting, but it had been spread on the runway in other cases of belly landings in an attempt to minimize damage and fire hazards.

But was it really worth the effort, and more important, was there time to do it? If foam was to be spread, where should it be started on



During slide the barrier guard (Fosdick) on belly allowed only limited damage to skin.

the runway and how long should the blanket be? What width? Could the emergency arresting gear be used? Knowledge was required to translate the bare words "foam the runway" to practical application.

The silence endured only a short while but the confusion which followed was less than helpful. A variety of suggestions and opinions were offered, each suggestion producing another which usually disagreed with the preceding one. Even as the group broke up and headed down to the crash trucks the passageways and ladders leading from the tower echoed with do's and don'ts, pro's and con's.

While this particular incident is fictitious, and it is easy to clear up the situation with a typewriter, it has its counterpart in real life. Initial confusion is the rule rather than the exception where foaming the runway is suggested. It has become obvious that there are conflicting opinions concerning the best procedures.

An explanation for the conflicting opinions may stem from the fact that foaming the runway for emergency landings is a relatively new technique. Secondly, the use of foam at one single military field is so infrequent as to make it appear unnecessary to put instructions on paper. The usual result is that any lessons previously learned are transferred from the station with the men who learned them.

Historically, the event which led to the present foam technique took place about 10 years ago. An airliner had arrived at New York City for landing but when the pilot dropped the gear, the nose wheel was found to be cocked at an extreme angle. There was not much to be done about it until someone hit upon the novel idea of hosing down the runway centerline with water. It was hoped the cocked nose wheel would slide when hitting the water and perhaps center itself correctly.

The system worked exactly as hoped. Upon landing the nose wheel touched the wet concrete, slid a few feet and snapped into place. An uneventful rollout followed.

Water was used on the runway for several cases of cocked nosewheels following the airliner's example. Then in 1952 an Air Force F-86 ended up circling in the traffic pattern with its nose wheel cocked 80 to 90 degrees. Supervisory personnel agreed upon an innovation and the runway was treated with a narrow strip of foam instead of the usual water. The pilot reported his nose wheel skidded in the foam so smoothly there was only a very slight occasional vibration to indicate the cocked condition. At 60 knots the wheel aligned itself.

From this time on, the practice of laying foam expanded almost naturally into cases involving blown tires, wheels-up landings, or where only one wheel was hung up. The variety also extends into the types of aircraft which have landed on foam. A civil pilot landed his one-ton Piper *Tri-Pacer* on foam when the nosewheel became damaged and the other extreme was an Air Force B-52 which belly landed on foam at about 130 tons.

While fire-fighting foam had been assuming this new function the reason for its use had also undergone a gradual but important change. The first use of water or foam had been merely to eliminate friction between runway and a cocked nosewheel but it began to be talked about in terms of fire protection. Speculation and attention centered on belly landings and "nose gear-up" landings with the thought that sparks and fires would be reduced or smothered during the slide.

This is the real core of the question "To foam or not to foam." Unfortunately it is also the part which cannot be answered with a quick "yes" or

"no." Due to the numerous variables present in any emergency landing, there is little chance of *positively* and *accurately* predicting the usefulness of foam in any given emergency.

A tentative statement by the National Fire Protection Association says a foamed runway is not of *proven* value as a means of reducing the likelihood of fire following impact nor is it of *proven* value as a means of mitigating the extent of damage to an aircraft making a wheels-up landing. However, during the past year the Naval Research Laboratory has been testing the fire-killing qualities of a foamed runway and the team of experts have come up with a general, but informative statement:

"Where there is likelihood of fuel source ignition from friction produced sparks on contacting a runway, the use of a correctly laid blanket of foam as a landing area can decrease the possibility of a fire from this source, by a significant factor in most cases." *(Further details from NRL tests will be announced in a future issue.—Ed.).*

This recent information, coupled with the past history of emergency landings on foamed runways, can form the guidelines for squadron or air station personnel when faced with the decision on whether or not to foam the runway for an emergency landing. Actually no simple clear-cut opinion can be gained from past history, but what has happened before serves as a highly useful signpost to the future.

Absence of foam on runway does not necessarily mean fire will occur. A4D on left landed on prepared foam strip. No foam was used for aircraft at right. No fire was reported in either case.


One of the first things which came out of a study of available records and material was the absence of fatalities and low injury rate to personnel in wheels-up landings on runways, *for both bare and foamed surfaces.* It follows that the primary objectives and benefits of foaming a runway can be viewed in terms of reduction of aircraft damage rather than protection of life. This is true insofar as normal fire fighting and crash facilities are not compromised by the foaming operation.

There appear to be four possible benefits from a foamed runway:

- Reducing the extent of damage to an aircraft by cushioning the contact between airframe and runway.
- Reducing the coefficient of friction and thus decrease (by permitting slippage) either the deceleration forces imposed on the plane and its occupants or its tendency to swerve.
- Reducing the friction spark hazard which is known to exist on certain dry runways and which constitutes a possible ignition source following impact-imposed damages to fuel tanks or system.
- Reducing the extent of fire hazard from a fuel spill following impact-imposed damage.

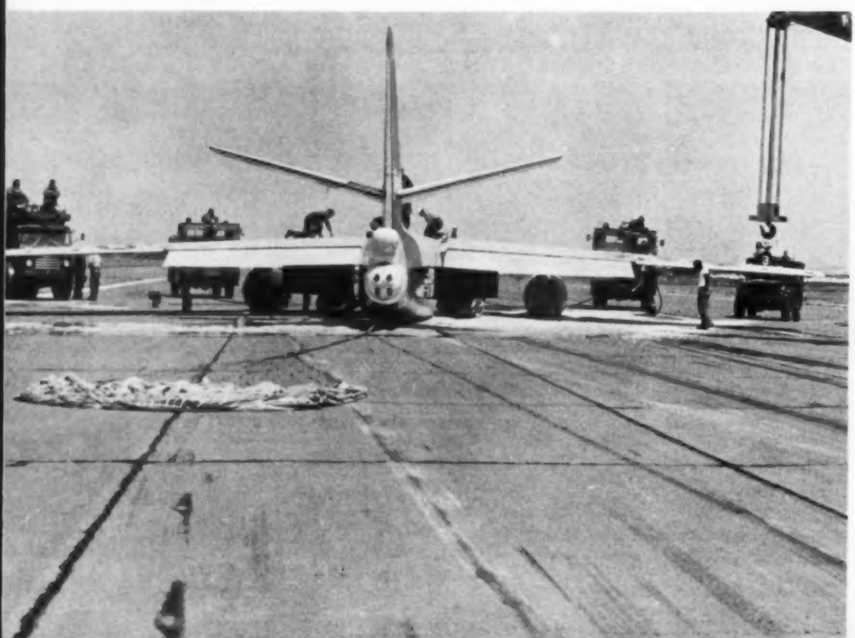
A fifth benefit may result from marking, unmistakably with a high-visibility material (as the foam is), the preselected area for emergency landing of crippled aircraft.

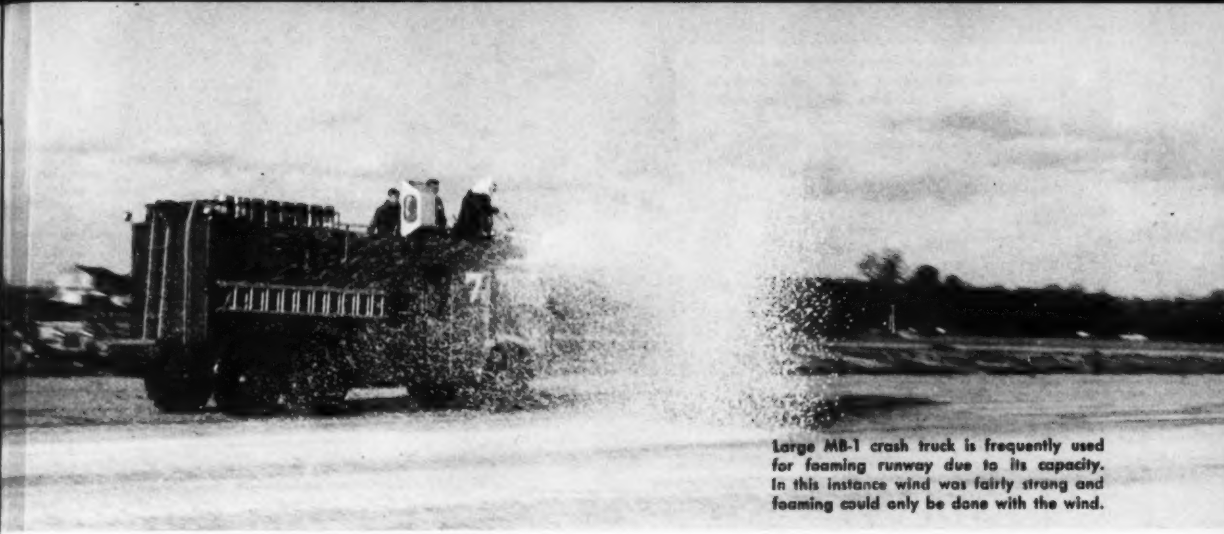
Statistics-wise this is how the question of foamed versus dry runway appears at present. The Air Force reported that of 24 cases in which foam was used, fire occurred in only one; conversely, in 34 gear-up landings without foam, fire occurred in 7 cases. Records at the Naval Aviation Safety Center list 16 wheels-up landings on foamed runways with one case of fire. Out of 70 wheels-up landings without foam, there were 15 instances of fire.

A ratio of one fire per every five belly landings on dry runways is in striking contrast to the record for foam (16 and 24 landings per fire) and at first glance you might say "there goes the ball game" in favor of foam. *One point however, throws the whole question open again.* In cases where a landing on foam was made, the pilot was able to rid the aircraft of excess fuel, either by burning down, dumping or jettisoning external tanks. On the other hand, the great majority of belly landings on dry runways were inadvertent wheels-up—the embarrassing "forgot to put the gear handle down" type. In this group the fuel load was generally much greater and some of the aircraft had fuel remaining in external tanks. Out of 15 fires, five of the aircraft involved carried fuel in external tanks and in some instances the fire was first seen in the vicinity of those tanks.

Question: Was foam responsible for the small percentage of fires? Or was it the light fuel load? Perhaps both factors helped, and if so, to what

Gear was accidentally retracted and the A3D touched on belly at about 120 knots. Small fires occurred at bottom of both engines. Picture lower, right shows usual belly abrasion pattern of wheels-up landing.





Large MB-1 crash truck is frequently used for foaming runway due to its capacity. In this instance wind was fairly strong and foaming could only be done with the wind.

degree was each responsible? There are no authoritative answers. On the negative side there is an opinion that the only advantages are psychological; the pilot feels that everything possible has been done to help him. This may be the clue which will tip a decision in favor of a foamed runway: The pilots like it. Representative, but slightly more enthusiastic than usual, is this pilot statement: "To the person who first thought of putting foam on the runway for a controlled crash landing I say, 'Thank you!' "

The Decision to Foam

In each decision on whether to use foam, the judgment of a number of people is involved but each emergency is unique in itself and in general, the Station Operations Officer will have the burden of the final "yes" or "no." However, the pilot's estimate of the situation and his subsequent actions will have a predominant effect on the end result.

Discovery of trouble generally begins with the pilot, though there are occasions when air controllers or wingmen may alert the pilot to an unsafe condition. Discovering the trouble sets the stage but does not begin the operation. Recycling the gear or going through the emergency procedures, may finally correct a malfunction, but then again, it may not.

There is a point at which the pilot must announce his difficulty, alerting ground personnel to the possibilities of a belly landing, even though he continues his attempts to get the gear down. For example, there was a case where a pilot discovered a malfunction when he had 40 minutes fuel remaining. By the time a decision was finally made to try an emergency arrested landing the fuel load was down to 650 pounds. A tower request to orbit while the runway was foamed had to be turned down by the pilot due to his low state. Other factors complicated this accident but it illustrates the need for timely and proper communication of the situation.

For sheer persistence in trying to lower a balky landing gear, the crew of an Air Force B-47 must take the trophy. They finally gave up and slid down the runway on a strip of foam but only after 16 hours in the air and 65 attempted emergency extensions, interspersed with five aerial refuelings!

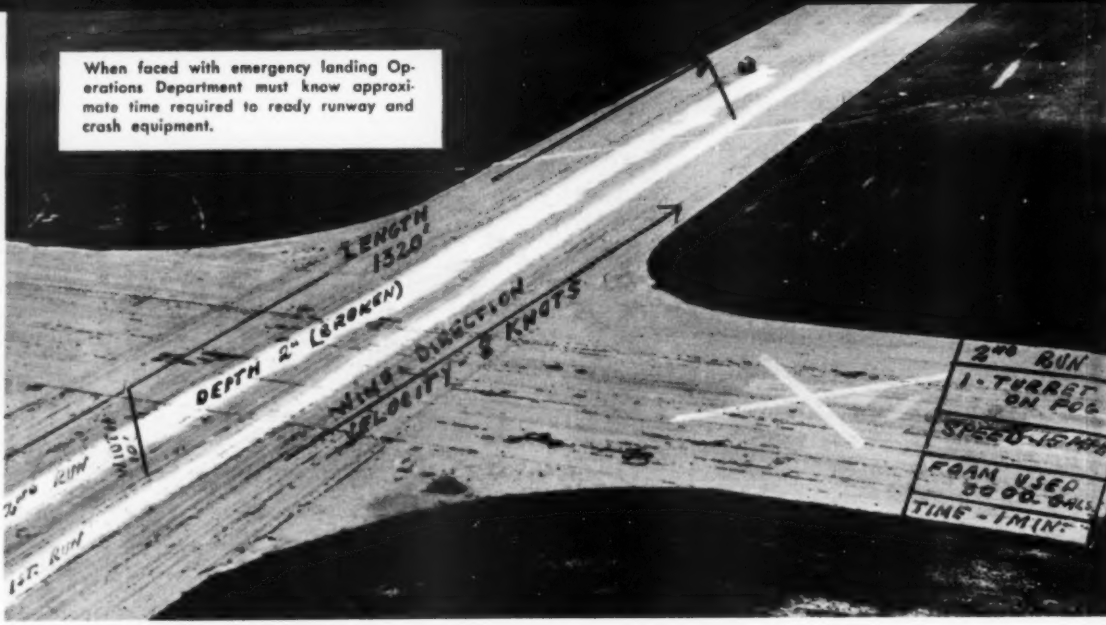
First consideration then, is an estimate of the hours and minutes of fuel remaining. All preparations hinge on this item.

The crash trucks require a basic time to lay the foam. Another length of time is needed to replenish the trucks with foam concentrate and water. A third period must be allowed for them to return to standby positions near the runway. The total is the time for the complete operation. Facilities and layout vary at each airfield so it is impossible to set up a figure to cover all stations. Preplanning with practice drills is one of the strong recommendations made by the aviation committee of the NFPA.

Only meager information on this subject is available from past occurrences. Few accident reports or crash and fire reports include or discuss the "time required" to complete the foaming.

However quickly the job is done, the depth of the foam being laid must be kept firmly in mind. Test results obtained by the Naval Research Laboratory indicate that an integral foam blanket of two inches in depth is required to do an effective job. In order to do this the rate of application will be much slower than that indicated in the Aircraft Fire Fighting and Rescue Manual (NavAer 00-80R-14).

Maximum runway area which can be covered to a 2-inch depth with an MB-1 crash truck (the



When faced with emergency landing Operations Department must know approximate time required to ready runway and crash equipment.

big one) is 4800 square feet per minute or a total of 10,000 square feet per load. The photograph at the top of the page shows a test run made at 15 mph with the crash truck laying a 10-foot-wide blanket reported to be 2 inches in depth. To obtain the required depth a 40-foot wide strip can be laid at a rate of only 120 feet per minute or a total of 240 feet of runway length per load.

At NAS Olathe one hour was used to lay down an extra large blanket for the belly landing of an airline *Constellation* (R7V). It measured 4500 feet by 135 feet and was a little over two inches thick. Time was no problem here as the aircraft circled three hours to burn down the fuel load.

Knowing the approximate time required to complete a foam strip gives a double value. The value is obvious when the aircraft fuel state is low. "Under no conditions," says one authority, "should a foam protective blanket be applied to a runway if time limitations or physical conditions would prevent all available vehicles from being fully operational at time of the actual touchdown . . ."

On the other hand, when the landing is to be delayed, as in the case of the *Constellation,* the foam should not be laid too early. There is a time limit on the effectiveness of the blanket but various estimates run from one to six hours. Rapid evaporation of water reduces the time, thus temperature, humidity, and wind are all factors. At NAS China Lake for example (Mojave desert area), the time limit would approach the one hour estimate.

The known approximate time to ready the runway can be used this way. Subtract it from the pilot's estimated time of landing and you come up with a target time to start the trucks toward the runway. Of course it is imperative that the pilot monitor his fuel remaining and revise his landing time as needed.

Aircraft Configuration

If the fuel state is the first factor to be considered, the configuration of the aircraft must be accounted second in importance. There are only four possible combinations of gear malfunction; all gear up, nose gear up, one main gear up, and main gear up with nose wheel extended, but details of the landing will vary slightly with each configuration. Each will be discussed separately.

Where field emergency arresting gear is available and the aircraft has a tailhook it must be decided whether or not to set up for an arrested landing. For instance, NASC recommends that the S2F/TF be belly-landed *without* using field arresting gear.

The matter of drop tanks is another variable. Generally, if they contained JP fuel and are empty at the time of landing they can be retained and will take the first slide damage. Use of field arresting gear and foamed runways has made some landings on external tanks successful enough to be reported as an incident; damage classed as limited. The high point of this technique was an F4D wheels-up landing which required two man hours to repair. After lifting the jet and lowering the gear, new drop tanks were installed and it was flown back to the carrier.

In all these items the advice and experience of squadron personnel is highly useful and their recommendations, based on more intimate knowledge of the specific aircraft concerned, can add refinements to the airfield's general foam technique.

BELLY LANDINGS

Now comes the matter of dimension and location of the foam pattern on the runway. Belly landings without field arresting gear will be considered first. A wide variety of aircraft have been involved in this type occurrence but a few rules apply to all of them.

First, don't waste foam by starting too near the threshold or touchdown end of the runway. Normal approach speeds should be used but even if the pilot aims for a normal touchdown point (500 feet from the end), with the landing gear retracted, first contact will be further down the runway than expected. A slight floating from ground effect will also tend to add distance to the touchdown. Thus, the first thousand feet at least, need not be foamed.

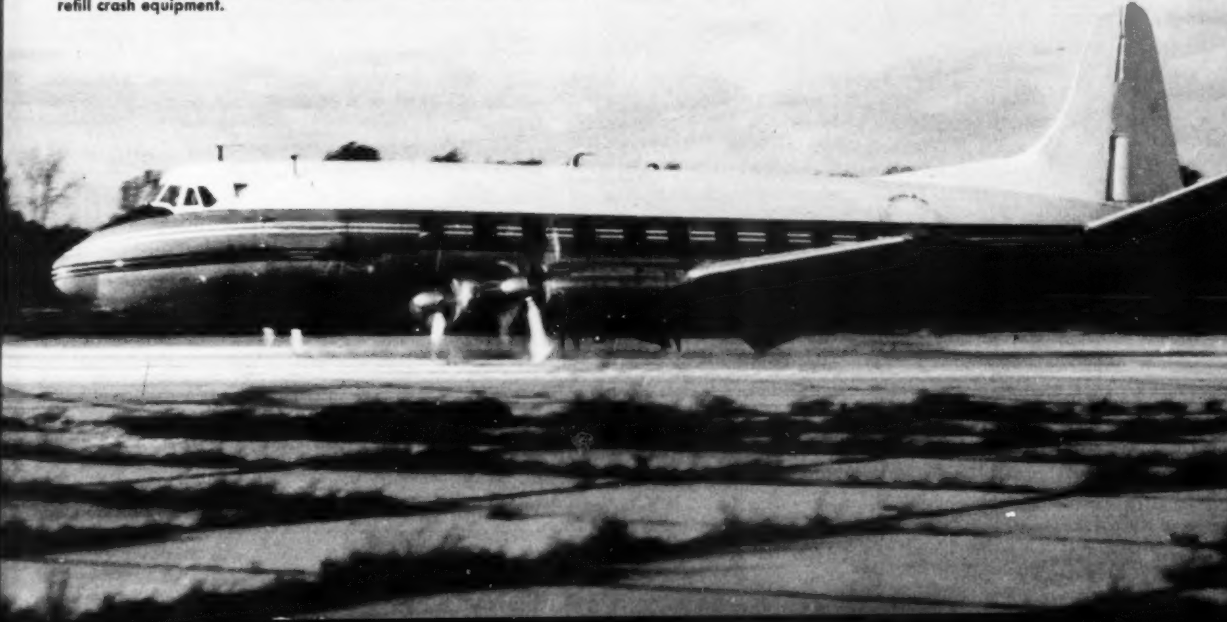
There are two things the pilot should strive for in a belly landing. One is a smooth touchdown and the other is to make first contact in the foam area. It does not appear that the touchdown offers any difficulty. With few exceptions, the pilots experiencing a wheels-up landing have remarked on the absence of any touchdown shock.

As to the importance of making the touchdown in the foam, tests show that if spilled fuel is ignited by touchdown and sparking on a dry runway, merely sliding into the foam cannot extinguish a fire.

The length of the foam strip is of course, going to be linked to the estimated distance the aircraft will slide.

There was no material on this aspect readily available but a second look at the wheels-up landings gave some information — using both inadvertent and emergency landings on foam. While average slide distances were charted, another interesting generality also resulted. In several accidents there had been speculation that the distance on foam would be appreciably greater than on a dry runway. A comparison of the two groups showed this was not so; whether dry or foamed, the slide distance will be roughly the same. NRL engineers found only a five percent difference in

In this striking photo, prop tips of airline *Viscount* are just beginning to curl from runway contact. One main gear was jammed in retracted position and decision was made to belly land on foam strip at NAS Glenview.
The 100-foot wide foam strip began 500 feet from threshold and continued for 2000 feet. No sparks were seen during aircraft's 2000-foot slide.
A total of 44 minutes was required to complete blanket and refill crash equipment.



sliding between a foamed strip and a dry concrete runway.

Of course these figures can not be guaranteed and must be considered simply as a guide. And in presenting them a modern parable is brought to mind. "Observe the turtle—he makes no progress till he sticks his neck out." At any rate, they are the most practical and realistic ones which could be found.

AD and T-28

Minimum slide distance was 800 feet and maximum 2000. These were isolated extremes. A conservative average (tending toward a longer distance) was 1300 feet.

S2F/TF

Minimum slide, 600 feet. Maximum 2200 feet. Average, again edging toward the longer distance, was 1700 feet.

Heavy Multi-Engine

For heavier multi-engine aircraft, such as P2V and four-engine transports, insufficient information was available to find an average. Some individual cases do at least provide a slim handhold for the man who needs to issue an order to the crash crew, hence their inclusion below is felt to be justified.

Airline DC-7 (similar to R6D)	2500 feet.
C-124	2500 feet.
R7V	1700 feet.
P2V	1600 feet.

Following the DC-7 wheels-up landing a civilian group recommended the following minimum foam strip: "At least 60 feet wide, four inches thick, and at least 2000 feet long, or one-half the landing distance at maximum landing weight. Foam should start at a point 1500 feet from the runway threshold, or for runways greater than 6000 feet, at a point ¼ the runway length from the threshold . . ."

Jet Aircraft

All Navy jet aircraft, with the exception of the A3D and F8U, were lumped together in determining an average slide distance as no significant difference appeared between straight-wing and swept-wing. There were also isolated extreme slide distances among the jets. Minimum was 1200 feet by an F9F. Maximum slide was 4000 feet also by an F9F. A conservative distance is 2800 feet. Out of 25 landings only 7 slid more than 2800 feet and just 4 aircraft went more than 3300 feet.

F8U

No estimate on the F8U slide distance can be made. So far it has been landed with nearly every combination of gear malfunction except the full wheels-up. The rule of thumb for transports (one-half the landing distance for maximum landing weight) may be useful in this relatively unknown area.

A3D

To date nobody has made a "pure" gear-up landing in the A3D (one where the gear was up on initial landing touchdown) but three cases furnish us with some idea of the slide distance. Two of these happened on rollout where the gear collapsed at a speed between 100 and 125 knots. The slide

A3D Bites Dust

In an article such as this, day to day events result in continuous modification of beliefs or statements. This is the case with the statement concerning no "pure" gear-up landings being made in the A3D. Shortly after that was written one did occur—an emergency type where the gear refused to come down.

The A3D was at an intermediate altitude when a loud but muffled explosion was heard and felt and an immediate loss of AC and DC generators was experienced. This was followed by the ADU overtemp warning light coming ON. The results were a loss of hydraulic power coupled with an electrical system breakdown.

Electing to ride the stricken plane to the ground, the Pax River test pilot headed for nearby Glynco Naval Air Station. When the emergency landing gear and flap controls were actuated the wheels and flaps didn't move.

No radio contact with the tower was possible. "I commenced an approach to runway 25 to alert the tower and observe landing conditions," said the pilot. "Observing a green light from the tower and crash trucks heading for the runway I allowed for a 5-mile final approach."

Speed on final was about 160 knots. Over the threshold the drag chute was deployed in an effort to reduce the speed. The 70,000-pound aircraft touched down at approximately 135-140 knots and skidded nearly 4500 feet. As the A3D slid to a stop the crew abandoned the aircraft through the overhead hatch and stood nearby as crash crews applied foam to prevent major fire.

was 2000 feet. Small fires under the engines were experienced in both accidents.

The other case was early retraction of the gear after takeoff with the aircraft settling back to the runway at an estimated 150 knots. Total distance from initial scrape marks of the belly to final stopping point off the end of the runway measured 2300 feet. No fire was reported.

Air Force experience with jet bombers has produced a rule of thumb which may provide some guidance for an A3D belly landing. This recommended foam pattern is 3000 feet long, 100 feet wide, starting 2000 feet from the approach end. The 100-foot width can be attributed to the outboard engines on the larger Air Force bombers so a more narrow pattern would be practicable for the A3D.

It is of interest to note that the two B47s which have landed on foam slid 1600 feet. The landing weight of one was 90,000 pounds. A B-52, weighing approximately 260,000 pounds, touched down on the belly at 155 knots and slid 5400 feet on the runway, veered off and went an additional 400 feet in the sod.

Foam Dimensions

The ideal operation has been described as one where the aircraft touches down in foam and stops before reaching the end of the blanket. It would be difficult to achieve this in every case without flooding the airfield with foam but reasonable success can be gained by taking the average slide distance and adding from two to four hundred feet (or whatever time permits) for the total foam strip.

A width of at least 30 feet has proven successful for single-engine (prop and jet) and for the S2F and smaller multi-engine. For larger multi-engine aircraft, a pattern as wide as the distance between the outboard engines plus 10 feet on each side is recommended.

If there is time, or a desire to increase the width, the "runout" end of the foam strip should receive first attention. In the early stage of the slide there is some directional control from the rudder. Toward the end there is none and a swerve sometimes develops, enough to move the aircraft close to the edge of the runway.

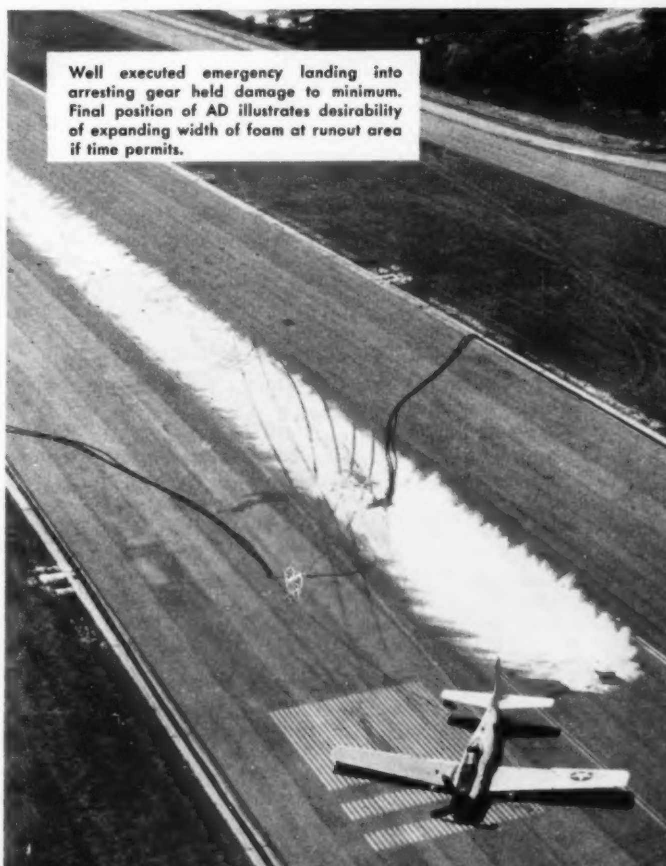
Whatever is done in regards to length, width and starting point of the foam, it must be relayed to the pilot of the distressed aircraft. Normal communications through the tower will be used in the initial contacts but during the final phase of the operation the use of a runway portable has proven superior. A pilot, acting as LSO, is able to provide better advisory information as the aircraft nears the runway and foam. This assistance is especially helpful at night or when field arresting gear is to be used.

Marking the beginning of the foam with a vehicle parked near the runway is another bit of assistance to the pilot. At night the vehicle can be parked so the lights shine across the runway. The arresting gear can also be marked in this fashion.

A gear-up landing will always foul a runway. Even if the crash crew never worked more swiftly and efficiently it may be too long for low state jets. Now consider that a belly slide is shorter than a normal landing roll and you come up with the interesting possibility of using a non-duty runway for the emergency landing on foam, even if it might be too short for normal jet operations. This philosophy led MCAS Beaufort to designate an abandoned runway for wheels-up field arrested landings.

Gear-Up Arrested Landing

A belly landing into the field arresting gear has frequently been "LSO" directed with the aircraft flown up the runway at low altitude, then cut prior to reaching the cross-deck pendant. The objective has been to have the aircraft a few feet off the deck as it passes the pendant. Though an in-flight en-

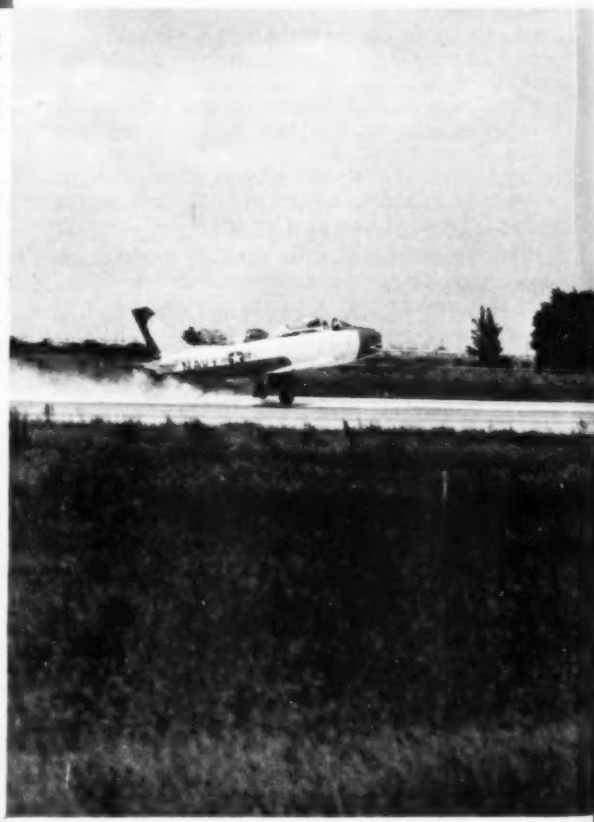


Well executed emergency landing into arresting gear held damage to minimum. Final position of AD illustrates desirability of expanding width of foam at runout area if time permits.

LEFT: A4D touched down 400 feet before reaching arresting gear but slid lightly over cross deck pendant for successful engagement.

BOTTOM, LEFT: Nose gear malfunction on Connie was discovered after takeoff. Pilot circled 3 hours to burn down fuel load then landed on foamed runway.

BELOW: Main wheels of FJ splash in foam as pilot touches down for arrested landing without nose wheel.



gagement results, this technique is felt to keep the airframe or external tanks from possibly fouling the cable, preventing a tailhook engagement. However, there is no certainty that this latter will happen as several models of aircraft have slid into the gear and been arrested without difficulty.

Short of the arresting gear, or "approach" side, no more than 500 feet of foam need be laid and two to three hundred feet has been satisfactory. Major effort in length and width should be on the "runout" side of the arresting gear; 700 to 1000 feet for prop aircraft and 1200 to 2000 for jets. However, width should not be sacrificed for distance. At the cross-deck pendant the foam should be 35 to 40 feet at least and if possible widened even further toward the end of the strip.

Nose Wheel Retracted

With the nose wheel retracted or trailing, and where the arresting gear will not be used, the nose is held off the runway until the speed drops about 20 to 30 knots below the touchdown speed. As a general rule the nose should be lowered gently to the runway before elevator effectiveness is completely lost to prevent a sudden uncontrolled impact. This is true even if the foam has not been reached. It is of interest to note that this type emergency has caused limited or minor damage in about half the cases.

There is no need to modify the normal VFR approach, either in speed or touchdown point, when landing without a nose wheel. The crash crew should start foaming at least 2000 feet from the approach end of the runway and if time is a factor, the strip can be begun 3000 feet from the approach end without compromising the foaming operation. Actually, from the evidence at hand, if the pilot touches down from 500 to a 1000 feet past the threshold it appears the 3000-foot figure has some advantages. Even if the nose should be lowered before reaching the foam, friction pressure will normally be lighter than at the end of the slide where the full weight of the aircraft is

Damage to the F8U was confined to the intake duct and nose-wheel doors. Slight wheel braking was used to shorten the landing roll. In a similar case the runway had to be cleared quickly for low state jets and the crash crew towed the aircraft by the tailhook, with the nose dragging on the deck. Additional damage was done to the underside of the duct but experience has proved this method of removal is most expeditious when speed is important.

on the nose section.

For prop aircraft (S2F and smaller), a 1000-foot strip of foam will generally suffice. Jets and large multi-engine prop types will require a greater length—at least 2000 feet. Here again it is hard to pinpoint a distance which will apply in every case and the 2000 feet will simply take care of *most* aircraft. For example one F8U slid only 1000 feet on the nose before stopping. The next time an F8U landed with the nose wheel retracted the crash crew foamed a 1000-foot strip of the runway. So what happened? This contrary aircraft slid 3000 feet on the nose.

Rudder and brakes allow some directional control so a narrow strip of foam is practical; a four-foot wide strip was used successfully with an S2F, but 10 to 15 feet allows for more error in lineup.

If a wider strip is deemed necessary it may be used without fear of compromising braking action. Air Force tests indicate there is a loss of only three percent in tractive efficiency from foam on a concrete surface. This information is of interest where there is a question of allowing aircraft to land before foam can be removed from the runway.

In the case of the TV-2 and F9F series, damage to the nose has been reduced by leaving the dive brakes down on the runout.

If there is a desire to use the field arresting gear when landing with the nose wheel up, the location of the arresting gear should be considered before a final decision is made. If mid-field or "short-field" gear (near the approach end) is not available an arrested landing is not recommended.

Using the abort gear is hazardous due to its normal location at the rollout or upwind end of the runway, and the technique needed to reach it —the nose must be kept well off the deck by landing long or keeping airspeed high with throttle. In the event of an unsuccessful arrestment (hook, skip, pendant failure, etc.) the situation is suddenly transformed into a puckering "high speed/limited runway" setup where emergency braking or a waveoff may not get you out of trouble.

Foaming for an arrested landing with the nose wheel up generally follows the same technique as that previously discussed for arrested belly landings.

Main Gear Up—Nose Extended

Landings where only the nose wheel is extended and the main gear is up, are infrequent but not unusual. Past experience shows they may be handled the same as a belly landing, as far as field arresting gear and foam are concerned.

ONE MAIN GEAR UP

Trouble with the main landing gear runs through many variations, ranging from a blown tire to instances where one gear is fully retracted. There is a need to narrow this general subject into several categories which are more easily handled. A nautral division comes with the question of whether or not the malfunctioning gear offered any support in the landing roll. Thus a landing gear strut, broken off at the axle but locked down, would be considered for the purpose of this article as offering support in the landing.

This leaves a category where the gear offered no support; wheel fully retracted, gear trailing, "unsafe" indication (possible complete collapse on touchdown) or hanging free with the drag links broken.

Such a landing is significantly different from a belly landing or nose-wheel-up landing. When one main gear is up, the path and actions of the aircraft are more unpredictable. Something you *can* predict at least, is a swerve in the rollout. It may be a gentle arcing to the side of the runway or a dust-raising ground loop. The plane might stop on the edge of the runway or go limping cross-country like a wounded bird who refuses to give up.

One similarity with the belly landing is the low injury/fatality rate connected with previous "one up and two down" landings. However, the *possibilities* of pilot injury appear to be greater due to the unpredictable aspect of the landing roll. Almost invariably the aircraft will swerve to the side which has the malfunctioning main gear; left gear up, swerve to the left, etc. Therefore the nature of the terrain next to the runway and the proximity of obstacles and positioning of crash equipment must be taken into account.

One main gear was retracted but this F8U emergency landing was complicated by a trailing nose wheel which collapsed and allowed extensive slide damage to forward fuselage. With the nose wheel extended, fuselage damage is sometimes limited to abraded skin on the aft section.

If for example, the aircraft is forecast to go to the left, what sort of ground lies on that side of the runway? Is it level or steeply sloping, rough, smooth, dry or swampy? Any ditches, holes or embankments? Are hangars, parked aircraft or fuel pits nearby? And don't forget the GCA trailer. Most of the pilots involved in these swerves commented on the complete lack of directional control once the wing drops—there's little you can do if the aircraft heads toward something immobile.

An interesting sidelight to this swerve business comes from an F8U accident where the starboard main gear was broken off. As the wingtip dropped to the runway, the pilot applied port brake to lessen the starboard swerve. Then he noticed an approaching runway intersection which angled 30 degrees to the right of his heading and he elected to try to steer this airplane down this runway.

The pilot released port brake pressure and attempted to tighten the swerve with nose wheel steering. He was successful and the F8U skidded onto the intersecting runway to complete the slideout.

In the event that a swerve off the duty runway would be highly undesirable and no other suitable runway is available, an alternate choice is a belly landing with all gear retracted. This alternate choice has been used more than half a dozen times in the last three years although few late model jets

For faster arrival at the scene of the accident, crash equipment was stationed near the runway. Due to wet ground, two heavy vehicles had to be positioned on the side to which the aircraft would probably swerve. The aircraft swerved, but not as planned. It bore-sighted the open space between the two vehicles and hit each one in passing.

have been involved. At present there is insufficient information to recommend one technique over the other as regards damage to the aircraft and the choice of a belly landing stems from a desire to minimize any possible hazard to personnel.

All this may seem far removed from the subject of foaming a runway for emergency landings but now, when it is brought up again, you can begin to see that foam is of little practical value for a landing with one main gear up. Only when the aircraft wingtip begins to drag does the foam get into action and this area of contact is small. Unless the complete width of the runway is foamed the wingtip is soon back on dry concrete as the aircraft swerves toward the dragging wing.

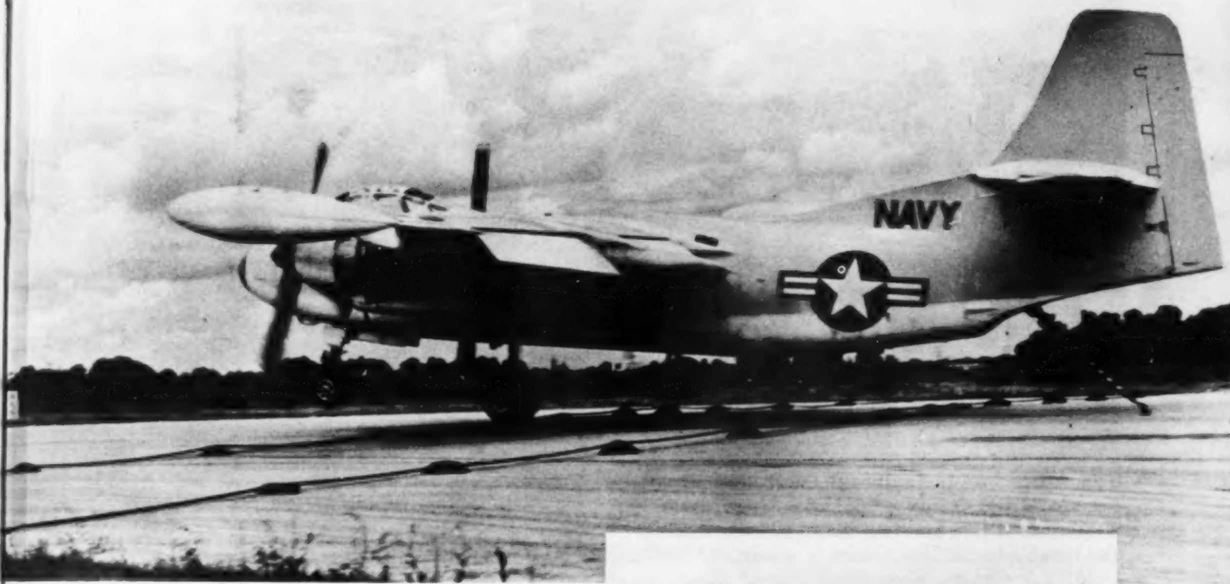
The only exception might seem to be when field arresting gear is to be used. Even here though, foam has not been particularly helpful. In the few cases where it was laid the strips were short, 500 feet or less, and the foam was not completely effective. Airspeed is needed to keep the wings level until arrestment. After arrestment deceleration was rapid but the aircraft were already near the end of the foam strip by the time the wingtips were firmly on the runway.

In the event a foam strip is desired it should be primarily behind the arresting gear (one crash crew laid it in front, on the approach side, where it was of little use). Centerline engagements are recommended and the people on the ground must assume the pilot will try for this. Thus, near the arresting gear, the center may be foamed but further down the runway attention should be shifted to the side of the runway. A foam strip laid with this in mind will end up curving gradually from the centerline to the edge of the runway.

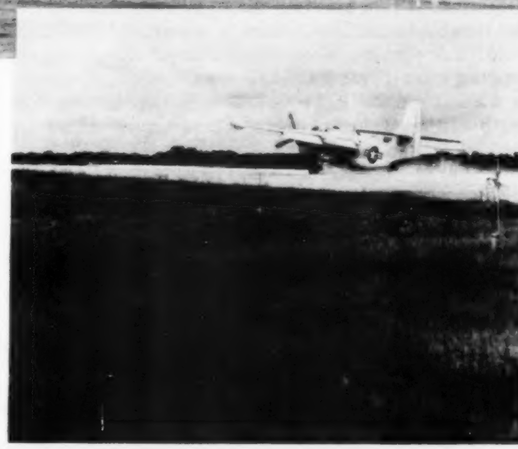
Where will the aircraft leave the runway? This is really unpredictable. In a group of high-

A4D at left used arresting gear; F9F in top photo (circled) did not. Both swerved in direction of disabled gear but arresting gear shortened and localized A4D rollout.

A blanket statement cannot be made and each emergency must be individually evaluated; however, in general, use of arresting gear is recommended where one main gear is up.



ABOVE: His right main gear unlocked, the pilot makes well-executed approach to emergency arresting gear. At right, AJ-2 is hooked and starts to sag as gear folds but, (right, below) foam strip is already passed as aircraft swerves.



performance jet accidents, where speed, weight, and pilot technique were somewhat similar, the aircraft went off the runway from 300 feet after arrestment all the way to 1200 feet.

Here is an appropriate spot to note a difference between "one main gear up" landings and those where the disabled gear offered some support in the rollout. In fact the amount of swerve after touchdown seems to be linked to the condition of the disabled gear; the closer the gear to a normal condition, the less the severity of the swerve. Increased directional control through wheel braking accounts for part of this fact.

An A3D pilot landing with one main strut bare to the brake assembly noted only a very slight swerve once the aircraft settled on the "stub." In the case of an F8U where the one wheel was lost "but the strut and axle appeared to be normal," the aircraft engaged field arresting gear and "veered slowly to the right, leaving the runway 1200 feet from the arresting gear at an estimated speed of 15 to 20 knots."

Foam was laid on the runway in both of these cases and one comment by the F8U accident board is of interest: "The path described by the aircraft did not change appreciably after leaving the side of the foamed strip, indicating that the foam had little or no effect on the friction of the dragging

axle, hence had insignificant effect on the path of the aircraft."

Compared to a landing where runway contact on the disabled side is made by a wingtip, foam may be of more value when a portion of the disabled landing gear (brake assembly, axle, sheared strut) is sliding on the runway. This is, in theory, due to the type of metal (steel versus aluminum) in contact with the runway and the associated friction sparks plus the proximity of hydraulic lines.

Once the landing portion of the emergency is over, that is when the aircraft stops and the pilot retreats from the cockpit, the crash crews move in. What happens then seems to depend on the individual crash crew. In a series of accident reports of the same type, where no fires were reported, there were photographs of planes with no foam on them, partially foamed aircraft, and dripping, foam-covered hulks which only resemble airplanes.

It is, of course, far better to err on the conservative side and beat down any possible fire before it gets going. But human nature being what it is, after a foam-flooded flying machine is turned over to its "owners" there are sometimes unhappy glances at the slimy mess with dark mutterings about "those trigger happy characters" and "corrosion."

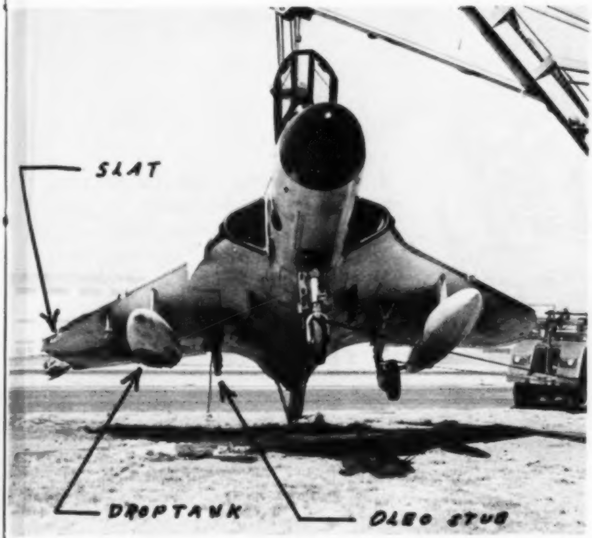
The manufacturer of foam concentrates says, "For practical purposes it may be considered that when foam liquid has been expanded into the foam bubble, there would be no corrosive effect on the material it is blanketing. There is, however, a small percentage of corrosive ingredients in the foam compound itself, but when this compound is mixed with water in the 6 percent injection ratio (automatic mixing in crash truck), the corrosive element is quite small and may be considered of no consequence."

Arresting gear and foam strip were used when this A3D lost starboard wheel. Landing A3D with disabled gear is becoming more common; latest was at NAS Sanford when wheel was lost on takeoff at MCAAS Yuma. Crew completed cross-country to Florida, made arrested landing on foamed runway.

Below; Auxiliary vehicle at Sanford spreads foam, keeping MB-1 fire truck ready for landing.

From a certain viewpoint, mostly after it's all over, there *are* undesirable aspects to the use of foam. On drying it leaves a slight gumming deposit. Therefore the aircraft should be washed externally and cleaned internally as soon as possible. Deposits of dried foam can be cleaned up with plain water but a longer time is required as it dissolves slowly. Hot water speeds the process.

A film of dried foam in a jet engine, especially in the close-tolerance compressor section, might logically call for engine removal from the aircraft. This dried residue of foam may possibly be held



Given choice to eject or try emergency landing when wheel assembly broke off, pilot used field arresting gear and foamed runway. Damage to slat occurred on attempted CV landing.

responsible for what is called corrosion in jet engines. A Pratt and Whitney manual, "General Operating Instructions for Axial Jet Engines," calls the foam mixture corrosive and a few squadron reports bring up that point. However, there are few specific details on the subject, even from units which mention corrosion in reports.

After an emergency landing, some of the factors which will influence foam removal and maintenance procedures are position of jet intakes (nose, wing or midfuselage as on the A4D), type of gear malfunction (possible foreign object damage from sliding on the nose or a swerve off the runway into the dirt), and placement of foam on the aircraft by the crash crew. So far as is known at present, it remains for the individual unit to decide on appropriate engine treatment.

As a matter of fact, "local option" or unit decision applies to much of the foamed runway story. Even with further accumulation of knowledge and experience there are some aspects which can hardly be reduced to a rigid, mechanical procedure. The variables involved make no two situations exactly alike, but from evidence distilled out of numerous tests and previous emergency landings, it is possible to draw some brief and general conclusions.

Of the possible benefits from a foamed runway previously discussed, two can be eliminated. Foam itself cannot reduce damage by "cushioning" the contact between airframe and runway. Neither can it materially reduce deceleration and swerving forces by permitting "slippage."

- Absence of foam on a runway does not automatically eliminate the chances of a successful (no fire) emergency landing but a correctly laid foam strip decreases the possibility of a fuel fire from friction sparks.
- Foam should not be laid if normal crash rescue or fire-fighting capabilities of the station will be compromised by the operation.
- The type of landing gear malfunction will determine the desirability of laying a foam strip, as well as influence the dimensions and location of the strip.

Guide lines for emergency landings can be improved but as always, there is no substitute for clear-headed, timely and accurate action in the cockpit and on the ground. ●

The extensive research and writing involved in this article were accomplished by Associate Editor Jack T. LeBarron. Some APPROACH articles from his pen are "TIME ZERO" of May '56; "OMNI" of June '56; "RUNWAY SHORTHAND," February '58; "REQUEST GCA" January '59; and "SPEED TRAP," June '59. In addition, his article "The Career Man" was an Honorable Mention winner published in the January '55 *"Naval Institute Proceedings."* LeBarron was in naval flight training during '45-'47 and presently holds an active commercial pilot's license with instrument certificate, plus an air controller's rating.

SPOT LANDING

OUR HUP-2 was just out of a third intermediate check and due to operational necessity (that, like zinc chromate, covers a multitude of sins) we were unable to get in a test flight before getting it up on the bow 10 minutes prior to a scheduled launch.

We came up number one elevator, spread the blades, started, and warmed up thoroughly. Who would think of going "down" now, with the air group lined up for the cats? Not *this* Anymouse! Anyway there was nothing seriously wrong. No excessive drop off on the mags, even if it was close, and the engine couldn't really be heard on account of those noisy F4Ds, so who was to say if it was running a mite rough. I knew at least we had a new set of sparkplugs. RPM was pretty steady. We launched.

About two minutes after getting airborne the HUP just didn't sound right. I tried another magneto check at 500 feet. WOW! On left mag it just barely kept going.

I called the ship and asked about possibilities of coming home (in a cool type voice you understand). They were just ready to launch number one. Well, that's that, I mumbled to myself.

About that time I took note of the fact we had a definite loss of power. With 36 inches of manifold pressure we were settling. Never mind the tone of voice now. I told primary-fly to hold the cats, we were coming in on number one elevator, ready or not!

With both mags we were unable to maintain altitude with anything under 38 inches and 2400 rpm. This would never do!

Touchdown was made, to the surprise of the jet pilots about to be thrown off the cats, and no sooner did we disengage rotors (33 knots over the deck) than it was apparent what part of the trouble was. We had lost a sparkplug in flight. It

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in readyrooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT, PREVENT AN ACCIDENT —

You may bluff your wife, your boss or your dog—but you can't bluff your airplane!

—*Anonymous*

came unscrewed and where it went no one knows. On the very same cylinder the other spark-plug lead was disconnected. This happened in flight too—One jug ended up doing nothing but pumping air.

Investigation led to the following: One man signed the check sheet during the intermediate inspection *while* another was doing (?) the work.

Maintenance goofed — almost as much as I did in not catching it. There was improper spark-plug torquing, improper inspection of the work upon completion and improper pilot headwork.

We all got together and hashed the thing over. Fault was pinned right where it belongs and all the offenders are well aware of it.

JET WASHED

SHORTLY after noon I was approaching a jet field, descending to enter the pattern. The aircraft was a TF-1, with the old blue paint job, airspeed 165 knots, altitude 3500 feet, 7 miles south of the field over the coastline.

While contacting the tower a roar filled the cockpit and an A4D flashed by at right angles to our course, directly in front. The jet wash shook our aircraft violently. His angle of climb was steep, 45 degrees plus, and airspeed was high.

As a result of my visit to the squadron the unit procedures were modified to permit high angle/high speed climbs *after* passing the coastline. This late corrective measure has no therapeutic effect on my newly acquired soprano voice.

(Please see "Wingtip Vortices," below.—Ed.).

Wingtip Vortices

It is unfortunate that vortices (often called prop or jet wash) are invisible. If they could be seen they would look like a pair of horizontal tornadoes stretching back from each wingtip. For miles astern these compact and fast-spinning air masses stay close together and parallel, sometimes undulating slightly, as a pair. They gradually weaken and die but can remain dangerous until their birthplace is far out of sight. Because the real hazard can be many miles astern and since it is neither thick nor wide, the probability of running into this insiduous danger by chance is extremely slim. However, the result is sure to be startling and may be lethal.

The intensity of the vortex is directly related to span loading and inversely related to airspeed; however, it is a safe and practical generalization that the bigger the ship the more violent and long-lived will be the vortex disturbance. Technically, the faster the plane is moving the less energy it casts off. The more it weighs in relation to its span, the greater will be its trailing danger. Also, the blows (the airloads) felt on piercing a vortex depend on the speed of entry. At half the speed the shock would be only one-fourth as great.

Don't pass close behind any other aircraft; the bigger it is the more time it should be given. Two minutes should suffice as a working rule. Avoid, when possible, places and altitudes frequented by large aircraft. Areas near high density airports, whether civil or military, should always be suspect. If you are to pass behind a crossing aircraft, change altitude so that you will be at least 100 feet higher or lower, preferably higher, and slow down. If you do get into a bad vortex, your best procedure is to ignore altitude changes and use no elevator control.—*Attachment to CAB accident investigation report of Piper aircraft crash blamed on C-124 turbulence.* (For more information see APPROACH July '56, page 4).

headmouse

Have a problem, or a question?
Send it to HEADMOUSE—he'll do his best to help.

R3350 Engine Fuel Discrepancy

Dear Headmouse:

A backfire of the engine caused a flame front to ignite oil on the engine parts outside of the failed airscoop/carburetor seal. It is undetermined as to whether or not the seal failed on this start or previously. An investigation of the aircraft and of the techniques employed by the pilots for engine starting revealed standardized procedures were understood and are being used by pilots and aircrewmen when starting cold engines.

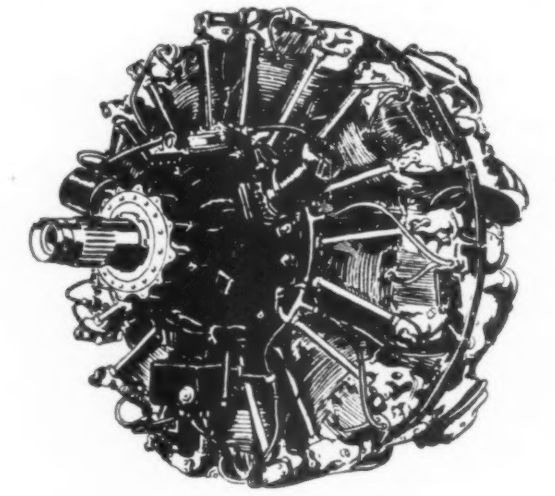
It was discovered, however, that if the engine was warm from previous running it was fairly common for the pilots to expect the engines to fire immediately upon the placing of the ignition switch ON, without priming or advancing the mixture. It was apparent that on these occasions that the individual pilots would not proceed in the same manner. Some pilots would immediately advance the mixture toward RICH, while others would wait until the surge stopped and then commence steady prime until a start was made. Many complaints of poor starts and overpriming were noted.

Under controlled conditions, using warm engines, NO PRIME, mixture in IDLE-CUT-OFF, starter engaged for a minimum of two revolutions, it was found that 6 of the 11 aircraft tested, fired when the ignition was turned ON and accelerated to 400-500 rpm before dying. This cycle can be repeated indefinitely, indicating a source of fuel sufficient to obtain a firing of probably each of the cylinders before the engine quits. All engines check out well on the power check and magneto check. They are smooth and accelerate well in all phases of operation. Each engine cuts out sharply when the mixture is moved to the IDLE-CUT-OFF position from any RPM. The supercharger drain valves operate properly, making it appear that the fuel is not in the blower section in sufficient quantity to be noticeable at the drain outlet. No evidence of primer leak was found.

It was noted that the Induction Spinner Valves in some aircraft would not indicate the retaining of the pre-set pressure of 10 pounds, but no correlation could be established.

It is believed that the foregoing can be responsible for pilot-induced backfires. Request that information be solicited from the various commands using AD aircraft and forwarded through you concerning their experience with this engine under "warm" start conditions.

L. LAVENAU, LCDR
NAS Grosse Ile, Mich.



► Because R3350 O&R facilities and a number of AD squadrons are practically in his backyard Headmouse and his lieutenants looked into this one locally. Here are their findings, conclusions and recommendations:

Four aircraft were checked at VA-42, NAS Oceana. This squadron had not experienced the difficulty in their starting procedures. The engines had been previously operated and were still warm (average CHT 105°C. and CAT 45°C.) when these tests were performed. The time since shutdown from previous operation of the engine ranged from 4 minutes to 30 minutes. Eight blades of the propeller were turned through. With the fuel boost pressure ON, *without* using the primer and with the mixture control in IDLE CUT-OFF, the engines fired immediately when the ignition was turned ON. Two of these same engines were later started in the same manner except that 16 blades of the propeller were rotated and the engines had been idle for an hour.

One of the carburetors from the test aircraft was given a flow bench check at O&R. There were no discrepancies within the

carburetor. As a matter of fact, the leakage of the mixture plates was less than five pounds per hour. Carburetors are passed through inspection that have mixture plate leakage of eight pounds per hour.

Analysis of the problem shows that a combination of events results in sufficient fuel being available in the induction system, permitting the engine to start without use of prime and with mixture control in IDLE CUT-OFF. Due to the configuration of the Bendix-Stromberg carburetor, fuel pressure tends to force the mixture plates off their seats. In addition, any warpage or deformation of the mixture plates provides a path for fuel to pass through the mixture plates. The pressure supplied by the fuel boost pump results in the allowable leakage of up to 8 pounds per hour.

On shutdown, when the mixture control is placed in IDLE CUT-OFF, the mixture plates are immediately positioned in the closed position. This shuts off the fuel flow sufficiently to cause the engine to cut off sharply. However, with pressure being supplied to the carburetor by the fuel boost pump, the fuel flow is not immediately reduced to the allowable level.

On the flow bench check of a normal carburetor with boost pressure applied, it was observed that it took from 45 to 60 seconds for the fuel flow through the mixture plates to reduce to the steady state leakage of approximately 5 pounds per hour. In the aircraft, this fuel travels through the fuel discharge line and is drawn through the spinner injection valve and collects in the lower part of the supercharger housing. The supercharger drain valve does not eliminate all of the accumulated fuel in the lower supercharger housing because it is not located at the lowest point. If the engine is warm from previous operation so that proper vaporization can occur, it can be started without use of prime and with mixture in IDLE CUT-OFF. Turning ON fuel boost pump for even a short period before beginning the starting procedure will permit normal leakage of the mixture plates to add to the quantity of fuel in the supercharger housing. This factor also contributes to the possibility of a hydraulic lock—for additional info on this subject see page 44 Jan '59 APPROACH.

It is therefore recommended that the subject engines be operated in the following manner:

- In starting, if involuntary start occurs, let the collected fuel burn out. Then continue normal starting procedure. Do not try to catch with mixture.
- Use a longer period of cranking before turning ON ignition. A minimum of 20 blades appears successful.
- Turn OFF the fuel boost pump prior to putting the mixture control in IDLE CUT-OFF when shutting down the engine.
- Do *not* turn ON the fuel boost pump prior to actually cranking the engine during the starting procedure.

Very resp'y,
HEADMOUSE

P.S. Comments from AD operators are still invited.

Fix Authority

Dear Headmouse:

VF-121 submitted a fix for a guard for the uplock in the F9F-8T on FLIGA 4-59 to prevent foreign objects from getting between the uplock and the deck, thus prohibiting lowering of the nose gear. The only acknowledgment of this was the article in APPROACH, page 30 of October 1959.

Does this constitute Bureau of Naval Weapons' approval?

CAG 12

► No, it does not. This material was published for information only. BuWeps is the only approving agency for this type of fix.

Publication by the Aviation Safety Center of a suggested fix or remedial action recommended by operating commands does not constitute BuWeps approval.

Attention is invited to BuAer Instruction NavAer 00.55B, which promulgates instructions concerning the incorporation of Aircraft Service Changes. Paragraph (4) is quoted in part for guidance and information: "Aircraft shall not be modified in accordance with information contained in Service Information Summaries, Bulletins and other unofficial technical publications prepared by commercial contractors, unless specifically authorized by Bureau of Aeronautics (MA Division). Configuration changes originated by Navy operations commands and rework activities shall be limited to the scope and procedures prescribed by BuAer Instruction NavAer 00.30A."

NavAer 00.30A states in effect that the bureau does not desire to prevent naval activities from accomplishing work of an experimental nature and/or developing corrective action to overcome material defects or unsatisfactory conditions in service aircraft. However, when considered desirable, activities are permitted to make a trial installation of proposed modification in a single aircraft without BuAer authorization provided that special procurement of material is not required, the operational status of the aircraft is not reduced, or structural loads, aerodynamic characteristics or performance is not affected. Further, that when unsatisfactory conditions exist, recommendations for the correction of such deficiencies shall be via a FUR.

Very resp'y,
HEADMOUSE

HIGH FASHION

The suit affords excellent anti-exposure protection and can also be used under water as long as the emergency oxygen lasts.

Donning the suit should always be accomplished with the assistance of trained personnel.

THE Service Test Division, Naval Air Test Center, has completed an evaluation of the Mk IV Goodrich lightweight full pressure suit. These suits are designed to afford protection in case of cabin pressurization failure, ejection or any other condition that would expose the pilot to ambient pressure above 35,000 feet. Extensive ground and flight tests have indicated that the suits effectively provide the protection for which they were designed.

Successive changes from the Mk III, Mod 0, brought about such features as relocating the entrance zipper from the back to the front, incorporation of a horizontal zipper in the hip area to permit torso extension when placing the neck ring over the head, arm, leg and torso lacings to facilitate sizing and integration of ventilation channels in the suit rather than the underwear. The Mk IV suit incorporates these features plus a neck ring and helmet base of decreased diameter. It has been flown in F8U-1/ -2, F4D-1, F4H-1 and A3J-1 airplanes. The suits which included the above modifications were compatible with all these airplanes except the F4D-1, which required an extension of the face curtain handle.

There is a moderate degree of distortion caused by the face-plate visor at night.

Donning

Donning the suit should always be accomplished with the assistance of trained personnel. Any attempts by the pilot to don the suit alone results in fatigue and interferes with constant suit inspection by assistants. It is suggested that there be at least one trained assistant for every three pilots. At this activity the helmet and gloves are left off until the pilot is seated in the airplane. An assistant then helps the pilot don these articles and assists in strapping him in the seat.

Suit Gives Pilot Ventilation

The lightweight full pressure suit is designed to permit ventilation to the pilot at all times. If the pilot for any reason is exposed to an altitude above 35,000 feet, the suit controller restricts the vent air outlet and causes the ventilation air to pressurize the suit, holding the pilot at a 35,000 feet equivalent in the suit. If the ventilation air supply is interrupted, the controller will pressurize the suit from the oxygen supply. *While the suit is pressurized, the face visor must not be raised (O_2/inhalation problems).*

The suit has been flown in the F8U-1, -2, F4D-1, F4H-1 and A3J-1. Only the F4D-1 required an extension of the face curtain handle.

Overpressurization Can Occur

Overpressurization of the suit has occurred. This condition can result from obstruction of the ventilation exhaust system. The most recent case of overpressurization resulted from nonstandard underwear plugging the suit vent port. Only the underwear with "Triloc" applied in the area of the exhaust port should be worn. This material will prevent obstruction of the ventilation air exhaust. *In case of overpressurization, do not open the visor because the high pressure on the chest will restrict breathing, perhaps to the point of pilot immobilization. The proper procedure to reduce pressure is to open a glove seal.* The controller should be checked periodically in accordance with Clothing and Survival Equipment Bulletins 2-59 and 3-59 to insure that there is no malfunction which would result in improper pressurization of the suit.

The suit receives vent air from either an external source or from the airplane (compressor bleed air in the F8U and a separate compressor in the F4D). As the suit is presently configured, however, it cannot accept sufficient aircraft vent air to adequately cool the pilot on a hot, humid day on the ground or at low altitudes. One reason for this is that the temperature of the aircraft vent air is not low enough. At the present time a portable ventilating unit is under fleet evaluation. The method used at NATC is to vent the unit in the dressing room with compressed clean, oil-free air at 3 psi and then transport the suited pilot to his airplane in an air-conditioned metro-truck.

Check Suit Frequently

The suit should be checked at frequent intervals. This should be done by inflating the suit after it has been donned by the pilot. Such testing will uncover any air leaks and improper fit or adjustment. The oxygen flow to the helmet and face seal should be frequently checked. *During the check of the face seal, the pilot should be reminded that he must inhale prior to opening the visor.* The horizontal chest strap should always be tightly secured to prevent excessive expansion in the shoulder areas during suit pressurization. Arm length adjustments should be such that on extending the arms the fingers exert slight pressure against the end of the gloves. This fit is necessary in order to be able to break the glove seal in case of suit overpressurization.

The lightweight full pressure suit affords excellent anti-exposure protection. It can also be used underwater as long as the emergency oxygen lasts.

Store Suits Carefully on Hangers

Great care must be exercised in handling and storing these suits. After use, they should be stored on hangers. Ideally they should be ventilated with air with not more than 50 percent humidity and a temperature not higher than 120°F. until dry. After drying, they should be hung in an area at lower temperature and similar humidity. Drying can be accomplished quickly by turning the suit inside out and hanging it in front of a fan. The helmets should be dried and then stored in the helmet bag. Before each flight, antifogging compound (Stock No. R51 BuAer XAE 101-1-8) should be applied to the face-plate. This compound has proven effective in reducing the amount of condensate that would normally accumulate on the face-plate and obscure vision.

Tips to Pilots

The following is a list of check items which may be helpful to the pilots wearing the suit:

- It is important to keep the pilot as cool as possible prior to manning the airplane. The time between manning the airplane and takeoff should be reduced to a minimum. The more hot and humid the weather, the more important this becomes. A suggested procedure is as follows: the pilot should dress in the suit, without the helmet and gloves, in an air-conditioned space. Helmet and gloves should be donned in the cockpit and external vent air should be used if available. In hot weather, the helmet can be donned, leaving the gloves off until after the engine is started to provide a high volume of air flow through the suit. The helmet visor should be worn open while the pilot taxis the aircraft with the canopy open.

- In the event that cabin pressure is lost, it is important that all straps are properly tightened. This cannot be accomplished once the suit is pressurized. The following procedure is suggested: tighten the chest and back helmet tie-down straps when the suit is donned. Side straps should be tightened just prior to entering the cockpit, and front helmet tie-down and torso straps after strapping in and donning the helmet. All straps should be plainly marked to facilitate tightening to the exact fit previously determined to be optimum.

- The gloves are easier to attach if the zipper is "started" prior to mating the cuff and O-ring seal.

- It is possible to lock the Mk IV helmet with the rear latches out of place. The rear latches should therefore be checked carefully after donning the helmet.

- It is important that the helmet face-seal fit snugly in order to prevent loss of oxygen. Like any other helmet, several hours of flight are required to mate the helmet properly to the wearer's

The time between manning the airplane and takeoff should be reduced to a minimum.

head. The best fit with maximum comfort will be obtained if the pilot himself molds the seal to his own face.

● In F8Us equipped with the oxygen low pressure warning light, difficulty has been encountered in that the light sometimes blinks at the end of inhalation. This is not considered serious unless the light remains on.

● In initially fitting the pressure suit to the pilot, note that it should not be fitted as snugly as the partial pressure suit. The suit can best be described as "a comfortable fit" wherein the suit is snug enough to prevent undue expansion when pressurized, yet causes no discomfort in the unpressurized state.

● It is best to keep a spare pair of moisture absorbing socks available to wear in lieu of the regular workday socks when flying in the suit.

● When flying in the suit at night, it will be noted that there is a moderate degree of distortion caused by the face-plate visor. This distortion is normal but when first encountered may be confused with the symptoms of hypoxia.

● In hot, humid weather the possibility of pilot heat exhaustion is present. Tolerance times vary with temperature and humidity, physical condition of the pilot, experience in the suit, emotional stability and individual tolerance to such conditions. The pilot's physical state can deteriorate very rapidly (in minutes) when he is sealed in the suit during hot, humid conditions. It is imperative that all personnel connected with full pressure suit operations be aware of this danger and be familiar with the symptoms. These are: weakness, fatigue, dizziness, nausea, pallor (paleness), visual disturbances and finally collapse. Pilots must be alert to the appearance of these symptoms in themselves or in other pilots.

● In the aircraft carrier readyroom, a pilot in a standby condition should wait without his helmet and gloves donned. Unless the readyroom temperature is kept below 70°F. (and humidity below 50 percent), cool vent air must be supplied. Without ventilation or with poor ventilation, readyroom temperatures above 85°F. are intolerable for the pilot wearing the pressure suit. An electric fan directed at the pilot's face makes him more comfortable.

● When conducting FCLPs or carrier qualification landings on hot days, pilots wearing the pressure suits are subjected to inadequate vent cooling and resultant thermal discomfort. Avoid the use of the suits under such conditions until the ventilation problem is satisfactorily solved.

—Naval Air Test Center, Patuxent River.

OVERHEAD the white-hot sun burned a hole in the blue-enameled dome of the sky. Heat reflected from the desert floor distorted the horizon like a pane of cheap, wavy glass. In the crevices of rocks and in the sketchy shade of scraggly bushes motionless lizards were almost invisible as they endured the blazing midday. The only sounds in the dry stillness were the pilot's labored breathing and his footsteps squeaking through the scorching sand.

Bareheaded, his face flushed, he plodded doggedly ahead. He had long ago stopped thinking about his experiences of the morning—the takeoff

from El Toro in the TV-2 . . . engine trouble on the return flight 15 minutes out of Albuquerque . . . flameout . . . airstart attempts . . . then ejection.

During his parachute descent, he had watched the aircraft hit a mesa and explode. He had landed on the smooth sand of a dry river bed. Improvising a shelter with his parachute, he had sat in the shade an hour. Knowing that the beginning of SAR would be delayed by his failure to radio his difficulty, position or intention to eject, he became obsessed with the idea of walking out of the desert. Abandoning his parachute, his life vest and all its signaling equipment, he started out, due north. His goal—Route 66, a distance of 12 miles in the blazing sun in 115° heat. Five hours later he was picked up on the highway in a state of shock.

Flight surgeons and survival officers, while rejoicing in this pilot's survival, are apt to become apoplectic and near-speechless on reading his case. Common sense and training went out the window as the pilot committed a half-dozen errors, all of which jeopardized his survival.

- He failed to call his position, difficulty and intention to eject prior to leaving the aircraft.
- He failed to activate his bailout oxygen.
- He failed to lower his APH-5 helmet visor. He lost his helmet and oxygen mask on ejection, a loss believed due to accidental unrecognized release of the Hardman retention fitting at the time of disconnecting equipment before ejection.
- He failed to stay with his parachute for shelter and identification after landing.
- He discarded all signal equipment before setting out on his 12-mile hike.
- He violated a basic rule of desert survival and made a daytime desert crossing on foot.

Flight Surgeon, Accident Board Comment

"It is obvious," the reporting flight surgeon states, "that neither hearing nor presenting survival lectures was sufficiently impressive to assure employment of safe survival practices in this case."

"There are many areas between Albuquerque and El Toro where several days' walking would be required to 'walk out,' " the Aircraft Accident Board observes. "Also the pilot could have been injured and rendered unable to walk. Either an ejection in a less desirable area or an injury would have necessitated a search of the entire area between Albuquerque and El Toro until he was found and rescued. Meanwhile he could very conceivably die of injuries or exposure."

If you should find yourself in a desert survival situation—stay put, get in the shade, and if possible, stay near the aircraft.

Tests have shown that the average man can expect to survive for two days in summer desert temperatures of 120°F. without any water at all—*if* he stays in the shade all the time and does no walking.* Every 10° cooler adds a day of life expectancy.

In normal life we lose a quart or more of water each day in the form of sweat. In a dry desert climate, we do not see the moisture of the sweat because it evaporates as fast as it is excreted from the pores. If you have plenty of water, your survival problem is considerably lessened—just keep drinking. Most survivors, however, do not parachute into the desert with a water supply available. They therefore *must* reduce water loss (sweat) at all costs. To do so, avoid exertion—take it easy—and get out of the sun.

Shade in the Desert?

Where can you find shade in a barren desert? The solution is at your fingertips; your parachute. When making your parachute shelter, remember that several layers of parachute cloth reflect heat more effectively and provide better shade than a single layer. The situation is further improved by an air space between the layers of material. Don't secure the sides of the covering to the ground or you will shut off the circulation of air.

For protection against sunstroke and to reduce sweating, keep your head and the back of your neck covered. You can make an Arab-style head-

**Survival Manual* (NavAer 00-80T-56)

dress from parachute cloth.

A parachute cloth bandana tied across your face will prevent sunburn. Keep the sleeves and legs of your flight suit rolled down. If you can find sticks or poles, your pilot chute can be rigged like a beach umbrella.

No attempt will be made here to summarize procedures for finding water and food in the desert. A wealth of material on this is available in survival manuals and training courses which your survival officer can supplement. However in passing, it may be worthwhile to mention as a source of water the barrel cactus which grows in the American desert. This rotund, keg-shaped cactus is an exception to the general rule that juices of cactus may be bitter or even nauseous. Cut off the top and the soft, melon-like pulp can be mashed against the sides and bottom of the plant with a stick or knife until the juice oozes out and collects in the center. The juice of most species is clear and pleasant tasting.

The glare of the sunlight reflected off the desert sands is a problem to survivors. If available, sunglasses, goggles or a tinted helmet visor give the best protection. However, for a substitute, you can improvise an eyeshade out of cardboard or parachute harness webbing.

To keep down the glare, fray the edges of the slits for your eyes and blacken the entire eyeshade with soot or grease. Blackening the bridge of your nose and the area under your eyes also reduces the effects of glare. Some survivors in the desert are reported to have built fires and smoked their clear eye glasses and goggles for protection against sun and glare.

Stay Near the Aircraft

Staying near the aircraft has obvious advantages in a desert survival situation and obvious difficulties in these days of ejection from high performance aircraft.

If the aircraft does not burn and you are close enough to reach it without a great deal of exertion you can rig your parachute shelter awning-style from a wing. (Make sure first that there is no possibility of the wing shifting. If the wing is low, you can hollow the sand out under it.) If the aircraft does burn, the smoke will be visible for miles and will attract search aircraft and rescue parties. Either way, aircraft wreckage is much more visible from the air than is a single survivor. This is illustrated by the following case:

An F3H pilot ejected 25 miles outside Yuma, Arizona. Unable to roll with the fall at the end of his parachute descent, he landed stiff-legged. He had a sudden sharp pain in his lower back and momentarily was unable to breathe. He attempted to get up and walk but could not due to severe back pain. (Later, physical examination and x-rays showed he had a fractured vertebra.)

In spite of his injuries, the pilot managed to throw his parachute over a bush for shelter from the sun. He got out his signal flares to be ready

for any search aircraft which might appear. The time was 1040. About ¾ of a mile away, he could see the burning wreckage of his plane.

At 1330, the pilot saw a helicopter come over. He fired both day and night flares without any response. Then he pulled his parachute off the bush, spread it on the ground and lay down on it. He was still not observed. He saw the helicopter fly over the burning wreckage and a second helicopter appeared and passed over him.

At this crucial point, in spite of his painful injuries, the pilot forced himself to walk toward the plane. He travelled an estimated 75 yards when he was seen and rescued. He had been in the desert heat of from 110° to 115° for three hours.

Signaling in Desert a Real Problem

Signaling is a real problem in the desert.

In the daytime, the desert haze and glare and the light color of the sand make flares difficult to see; colored daysmoke signals are more visible. A tin can filled with sand soaked with gasoline (and lighted carefully) with oil and pieces of rubber added makes a dense smoke signal. At night, gasoline can be burned the same way for a signal. Brush fires and, of course, the flares from your life vest or survival vest are effective night signals.

Shadow signals which are visible from the air can be made by digging trenches or placing rocks in lines. For attracting the attention of search aircraft, parachute cloth can be dyed red by allowing the red dust of the daysmoke signal to settle after the signal has been set off. Orange flight suits and helmets painted with high visibility paint help make you visible from the air. Some pilots have suggested carrying red or orange nylon scarves to wave as signals.

Your signal mirror will be effective in the desert provided there is not too much haze.

● Remember, the best thing to do in a desert survival situation is to get in shade, reduce body water loss and, if possible, stay put near the aircraft until you are rescued.

● If you can, radio position and intention to eject before you leave the aircraft.

● Travel only if you are sure you can walk to assistance easily and are absolutely certain you have enough water to make it.

● If you must travel any distance, do so at night or in the cool hours of evening or dawn.

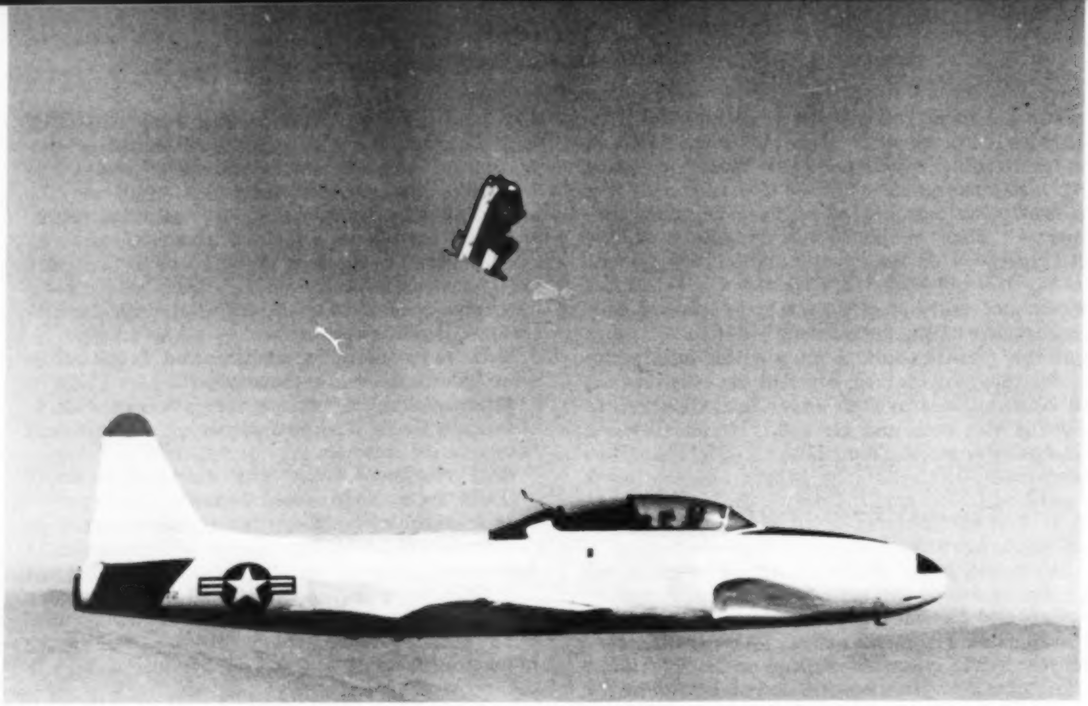
In the desolate burning reaches of a desert, your chance for survival depends on two things—(1) how much you have been told and remember about how to survive in the desert and (2) how much common sense you can muster. Your survival officer can help you on the first count. The second is up to you. ●

References:

Survival Manual (NavAer 00-80T-56)
Sun, Sand & Survival (AF-ADTIC Pub. No. D-102, Jan., 1953)
Survival (AF Manual 64-5)
The Desert Survival Field Test (AF-ADTIC Pub. No. D-104)
How To Survive on Land and Sea (NavAer 00-80S-56)

Films:

"Land And Live In The Desert" (MA-3854)
"Heat Exhaustion, Sunstroke, and Burns" (MN-6466B)
"Survival Procedures-Water" (SA-5646F)



EJECTION FROM TV-2

THE pilot and dual pilot of a TV-2 ejected successfully after the aircraft went into an uncontrollable spin. They were picked up by helicopter and returned to the NAS. The flight surgeon reports two items of interest in this accident:

- Neither man wore an anti-G suit on this flight. During some of the acrobatic maneuvers practiced, they received almost 4.5 G. One of the men had the mistaken idea that without the use of an anti-G suit, a "tolerance" to G-forces can be built up.

- To jettison the canopy prior to ejecting, the pilot pulled the canopy jettison T-handle. Neither man was aware that in ejecting from the TV-2 the primary method of emergency canopy removal is by armrest actuation.

Pockets

AS THE HSS-1 settled into the water following a ditching due to engine failure, the copilot released his safety belt and started to leave the aircraft from the port side. Partly out, he realized that the aircraft was rolling to the left and coming down on top of him and tried to hurry.

"Just at this point all of a sudden I couldn't move," he reports. "Something on my left side near my life vest toggle was holding me. I pulled on this cord which was apparently caught on something in the cockpit. It might have been the life vest signal mirror getting hooked or wrapped around the collective . . ."

The pilot went back into the cockpit under 2 to 3 feet of water and freed himself. He then exited from the right side of the cockpit and surfaced. After his rescue by another helicopter a few minutes later, he observed that his signal mirror and mirror lanyard had been torn away from his life vest and lost.

In the newer MK-2 life vest (FSN R4220-589-6845-GA21—Mil. Spec. V-6077(AER)) the life vest mirror and mirror lanyard and the whistle and whistle lanyard should be worn inside the gear pockets. If your life vest is the older model and does not have these pockets, your whistle and lanyard will fit in a flare pocket and your mirror and mirror lanyard can be carried in your flight suit.

PR-2 Life Raft

THREE survivors of an HSS-1N ditching inflated their life

vests, then inflated and boarded their PR-2 life rafts. The men held on to each other's rafts to stay together. They were rescued by a submarine.

The reporting flight surgeon endorses the use of the PR-2 life raft instead of the PK-2 in helicopters. Review of previous ditchings by helicopter crews indicates that removal of the PK-2 from the aircraft was the exception rather than the rule, he states.

The PR-2 life raft is authorized by the Section H Allowance List for use by pilot and nonpilot crewmembers of assigned helicopter aircraft. The Federal Stock Number for the PR-2 is RH4220-555-0785-LA20.

International Orange

REPORTING on a recent S2F-1 accident, the flight surgeon states that the survivors' international orange hard hats were a great deal of help in locating the men *even though it was night.* The survivors' life vest flashlights and the searchlights from the destroyers reflected from the helmets.

No G-Suit

INVESTIGATION of an F9F-6D's uncontrolled collision with the water after a low altitude stall on a gun tracking exercise disclosed that the pilot was not wearing an anti-G suit. Both the pilot and the aircraft were lost.

"The direct cause of this accident was the determination of the pilot to complete the maneuver he started—a maneuver which was beyond the aircraft's design capability and probably beyond the pilot's endurance without anti-blackout protection," an endorser of the AAR states.

OpNavInst 3710.7A of 31 Dec 56 states: "Anti-blackout suits shall be worn and connected in aircraft equipped for their use on all gunnery, dive-bombing, rocket, strafing, simulated combat and acrobatic flights and on all other flights where high G-forces may be encountered."

Habit Transfer

AFTER an incident in which a student pilot in an F9F-8T inadvertently actuated the normal trim button, investigation revealed that he held the control column grip in such a manner that he could inadvertently trim the aircraft nose-down with stick movement in either direction. All pilots were made aware of the consequences of mispositioning the hand and inadvertent trim operation and were further instructed to place the side of the hand on the rest provided and to keep the hand well away from the trim switch.

"Little Black Box to Tower . . .
Little Black Box to Tower . . ."

The following week at the same NAAS, a similar incident took place. Flying with his hand on top of the control stick, the student pilot almost trimmed himself into the ground during final approach to landing.

As this was the second case of a student holding the control stick in an improper and potentially dangerous manner, the NAAS made a thorough investigation to determine the origin of the practice. It was found that during Basic Training some instructors encourage the students to hold the stick from above. This practice may have some merit in basic trainers, the incident report states, but it tends to develop habits which can lead to a dangerous situation when carried over to fleet aircraft with stick mounted trim control.

Over-Confidence

"WHILE self-confidence is a basic requirement in aviation, overconfidence may lead to relaxation of alertness and thus inattention to safety principles."

—*Flight Surgeon in MOR*

That Tired Feeling

"THE pilot's complaint of fatigue prior to the hop must be considered a contributing factor. It is one thing to feel tired while sitting at home playing bridge but a completely different evaluation exists when one feels a little tired when flying high performance aircraft off a carrier at night for your first night trip. This is not only the fatigue of a long day but also of anxiety. Fatigue leads to aircraft accidents."—*Flight Surgeon in MOR.*

Night Action

"SHORTLY after being catapulted in an F4D, I placed the landing gear handle UP. After a normal amount of time had elapsed I still had a 'gear unsafe' light and determined the starboard main landing gear was in an intermediate position. I cycled the gear several times (getting a severe yaw when the gear came down) in an attempt to fully raise or lower the starboard MLG. This was unsuccessful.

"My wingman joined up and informed me the starboard gear was partially retracted and wedged between the gear door and wing. I passed this information to the ship and told them I would continue my attempts to drop the gear and would keep them informed. After about half an hour of trying all combinations of positive and negative G at varying airspeeds, yawing and skidding with the gear handle in both up and down positions and pulling the emergency gear release while going through these maneuvers, it became evident that the starboard gear was not going to move.

"The ship was informed and I was told to standby for recovery after all other aircraft had been brought aboard. I then requested to divert to shore and make a wheels-up at a naval air facility there. After a short delay permission was granted.

"I felt very confident that I could make a wheels-up landing on the external tanks and do only minor damage to the aircraft. At about 2300 I departed the vicinity of the ship and arrived over the airfield 25 minutes later. About 10 minutes prior to my arrival I had contacted the tower and advised them of my position and intentions. Actually my diversion and landing intentions had already been passed to the field prior to the time I contacted the tower.

"I requested that the crash crew lay a foam strip on the duty runway starting it about 2000 feet from the touchdown end of the runway, and that the beginning of the foam strip be marked by the headlights of one or more crash vehicles parked alongside the runway. While I orbited over the field to burndown the runway was being prepared.

"The dimensions of the foam strip were reported as being 25 feet wide, 1500 feet long, commencing 3000 feet from the approach end of the runway. I wanted to land with a fuel state of less than 1000 pounds so when I had 1200 pounds I told the tower I would make one low pass down the runway prior to making my final landing. During this pass I asked if a portable UHF set could be placed in the vicinity of the runway so that someone could give me altitude information as I flew down the runway prior to touchdown. Since the foam strip was so short, I felt this would be an aid to touching down as near the landing end of the foam as possible.

"The radio was obtained and was manned by GCA personnel. A satisfactory radio check was made and I explained to the operator what I wanted him to do.

"While going downwind prior to commencing my final approach I removed my parachute harness and raft lanyard to expedite leaving the aircraft after landing. My external tanks had been empty for about an hour with the transfer switch ON to purge the tanks.

"I flew a deep 90 to allow maximum time for lineup and altitude control—approach speed was maintained between 125-128 knots. Descent was stopped about 6 feet off the runway and I continued at this altitude until passing over the beginning of the foam. At this point I decreased power slightly, held my attitude and the aircraft settled gently on the runway about 50 feet beyond the start of the foam.

"There was no noticeable touchdown shock and only a very slight jolt as the downward motion of the nose was stopped. The engine was secured on touchdown as were all cockpit switches. Shortly after touchdown the aircraft began a slight turn to starboard which was easily corrected with rudder—the remainder of the slideout was uneventful.

"The aircraft came to rest about 10 feet from the runway centerline making a 10- to 15-degree turn to starboard upon stopping (length of the slide was approximately 2000 feet). After insuring that all switches were OFF, I abandoned the aircraft.

"The landing was highly successful; the only damage was to the external fuel tanks. After the starboard strut spacer was replaced, new tanks were installed and I flew the aircraft back to the ship the day after the wheels-up landing." ●

OVERDONE: The pilot admitted later that the primary cause of this accident was an attempt to clear the landing area too fast with excessive use of throttle. His actions were complicated by a flight deck wet from a rainshower, and a starboard list as the ship turned to port—but the corrective action is evident.

Roman Holiday

THE USS FORRESTAL was operating in the Mediterranean and Lt. Comdr. Taft was returning to the ship at night after completing a simulated strike mission in his A3D. A TacAN penetration and CCA were required due to low ceiling, drizzle and the impenetrable blackness so characteristic of nights in the Med.

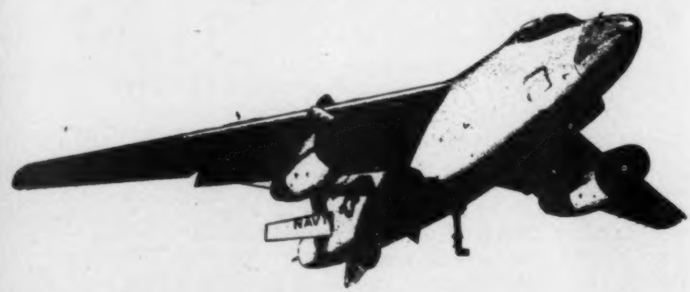
On landing, the hook failed to catch a wire and a stream of sparks indicated that something had gone wrong with one of the landing gear mounts. Subsequent low passes through a searchlight beam from the ship confirmed that the port main wheel was missing.

At that time, the squadron had little knowledge of how the A3D would act when landed with only one main gear. Diversion of the aircraft was still considered the safest course. It was deemed necessary to have the plane divert with gear down since the extent of damage was not known and there was a possibility that the gear would jam in the wheel wells.

With 5000 pounds of fuel remaining, the only field in range was Rome. It would be touchy because the field is hard to find due to surrounding light patterns and the pilot was unfamiliar with the area. A steer to Rome was given.

The trip would take 30 minutes and 3000 pounds of fuel. There might be enough JP left for one waveoff but there would be none to allow for searching for the field. The weather at Rome was 1200 overcast, visibility 7 in haze. There were no radio aids at the field and fuel to go by way of Rome omni could not be spared.

Diversion was made at 1000 feet, gear down. When last heard on the ship's radio, the pilot was talking to Rome tower from 40 miles out and asking for foam on the runway. The transmission was quite calm and faded out as Lt. Comdr. Taft attempted an Italianized phonetic spelling of "foam"—FOXTROT — OSCAR — MIKE — ALFA — "FOMA."



Some confusion resulted from the glow emanating from the Eternal City. The tower operator vectored the A3D to the field by having the pilot describe the light patterns and radio towers over which he was flying. With the predicted 2000 pounds of fuel still on board, the plane arrived at the break.

Rome tower apparently had received the "foma" message. There was plenty of foam available—all in a truck at the approach end of the runway. Time was running out and the fuel low level warning light had been on for 10 minutes. A landing of some sort was imminent.

Approach to the damp but unfoamed runway was uneventful with four knots of wind on the nose. The plane touched down 325 feet from the approach end of the runway and on the extreme right side to allow for the expected swerve to the left. The drag chute was deployed immediately, greatly improving directional control. Right wheel braking, right rudder and right aileron kept the A3D rolling down the runway with only a slight drift to port.

During the last 30 feet of the 4000-foot rollout, the dragging stub took over completely and the plane eased off the left side of the runway. The stub slid one-foot off the runway as the aircraft came to a gentle stop. The stub then sank slowly into the soft soil until the port wing tip touched the ground.

Early the next morning, the A3D was hoisted into a horizontal position by a locally supplied cherry picker. The new wheel and lower strut flown ashore from the FORRESTAL were installed. No further damage could be found.

Lt. Comdr. Jesse W. Taft and his crew, Lt. (jg) A. J. McCarthy and W. C. Schulze, AQ2, returned to the carrier on the second morning in the same A3D.

"Jet crashed?"

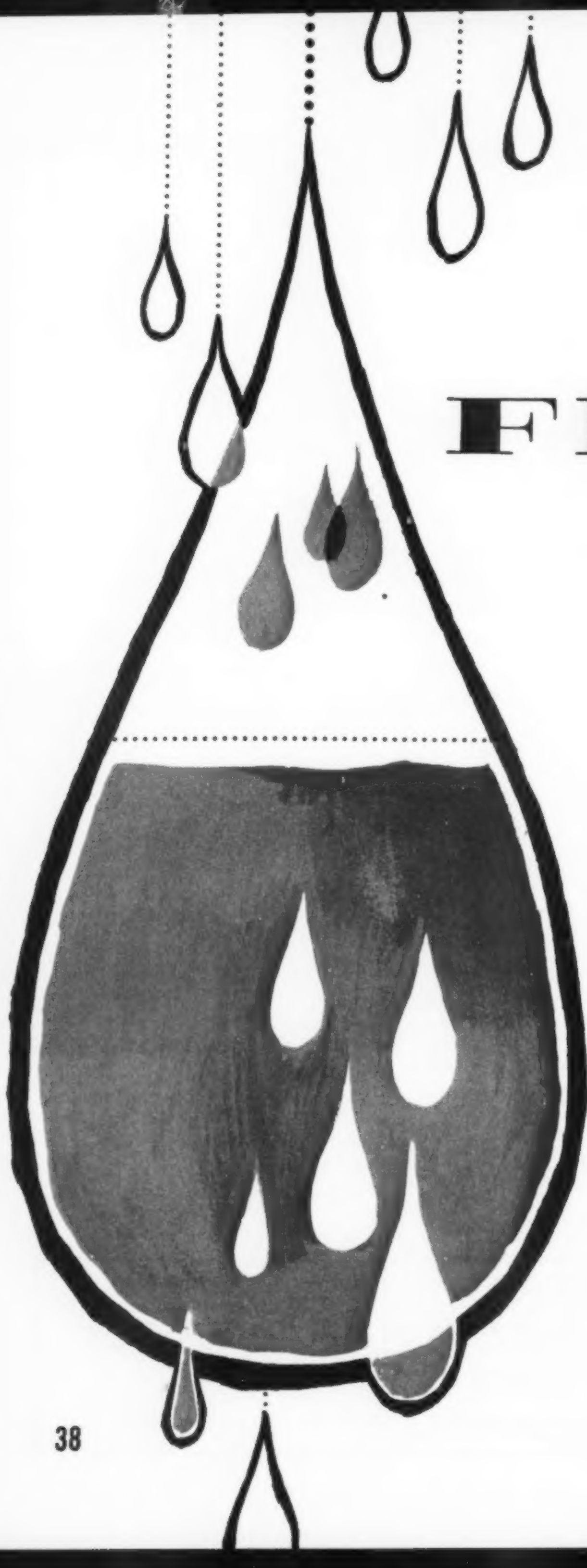
"MY WRENCH!"

"Went through the turbines?"

"A million dollar loss?"

"All on account of me?"

MORAL:
INVENTORY TOOLS AND HARDWARE
BEFORE
EVERY TURN-UP!



FUEL OUT, FLAME OUT!

THIS F8U-1P pilot was flying his second FMLP of the day. He and one other pilot were the only aircraft in the pattern. Another squadron aircraft had blown a tire on rollout from a fuel landing, and was on the overrun at the end of runway. Because of the foul deck, the pilot had been making mirror passes to a wave-off rather than to a touchdown. The pilot elected to make a final landing. He climbed to approximately 1400 feet at the 180-degree position (1200′ above terrain level). After turning off the 180-degree position and before reaching the 90-degree position, the engine flamed out. At this time the pilot had approximately 1400 pounds of fuel indicated by main fuel quantity gage. He made two unsuccessful attempts to restart the engine, and then ejected at an altitude estimated to be 300-400 feet. All components in the ejection system functioned properly, but the pilot sustained a broken left ankle when he struck a tree.

Following the ejection, the aircraft continued on a flight path for about 1250 feet before impact with the ground. The duration of the flight from takeoff to crash was approximately 30 minutes.

A F8U-1 main fuel quantity gage instead of an F8U-1P gage had been installed by squadron maintenance personnel. The system had not been calibrated. Fuel exhaustion caused flameout.

The squadron's normal supply procedures were completely disregarded in an effort to ready all aircraft for deployment. It was recommended that *all* parts be obtained via requisition through established channels so that personnel at echelons in-

volved can verify the part number concerned.

Since supervisory personnel took no action when informed that an F8U-1 gage had been installed in this aircraft it was recommended that supervisory personnel investigate all discrepancies reported, and further, to encourage and insist that all discrepancies be reported.

The installation of ASC 290 (low fuel warning light) in all probability would have prevented the accident. It was recommended that the delivery and installation of ASC 290 be expedited.

Had the main fuel quantity indicator installation been properly inspected by qualified personnel the fact that a wrong part had been installed would have been detected. Further, the fact that the HMI had not been followed in the installation would have been noted. It was recommended that senior supervisory personnel be assigned primary duties as inspectors. Further, that all work except flight line maintenance be initiated by work orders, and that completed work orders be screened to insure that the appropriate inspector has signed the work order.

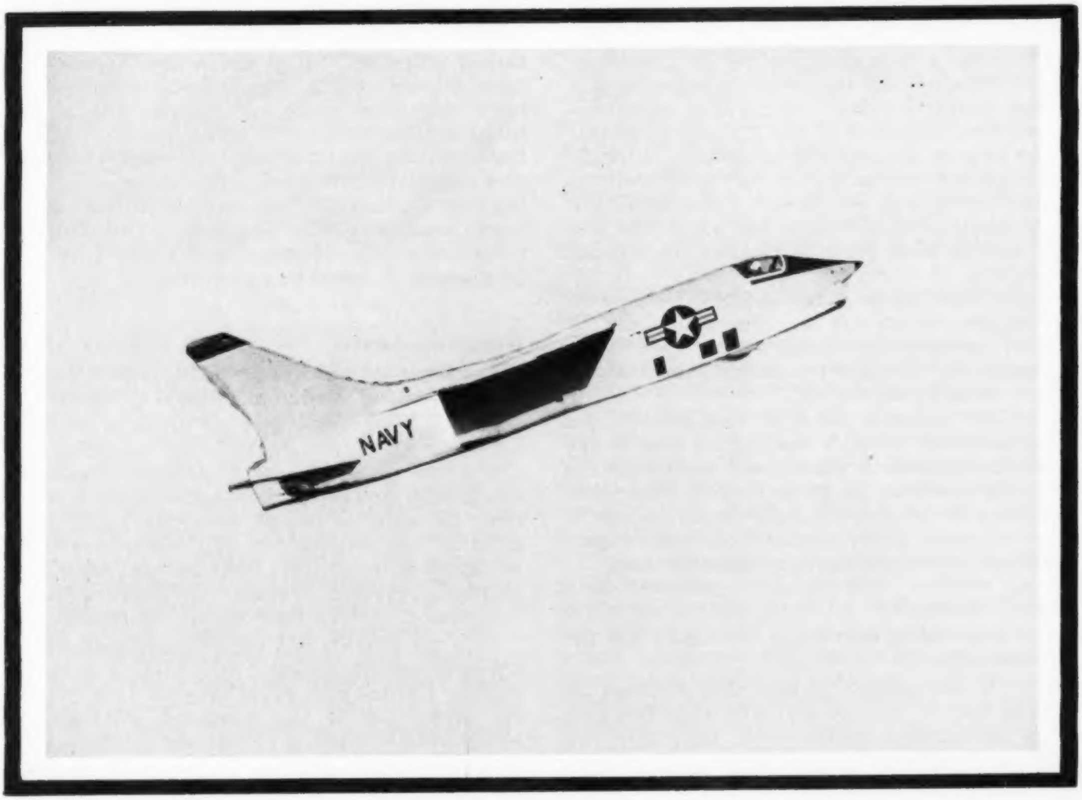
The absence of a usage code following part number 383018-20658 in the Illustrated Parts Breakdown, NavAer 01-45 HHA-4-2, page 667, introduced the possibility that this part, "preferred" for the F8U-1, might mistakenly be considered as "preferred" for the F8U-1P. It was recommended that the IPB be screened and revised where necessary to insure that all parts not common to both aircraft are properly designated by usage codes.

Squadron Endorsement.

1. Forwarded, concurring with the board's analysis, comments and recommendations except as noted below.

a. In fact there was no real rush to get the aircraft ready for deployment. It has been repeatedly emphasized to all hands that short cuts and rushing are not conducive to good maintenance procedures. However, the desire of the men to launch all aircraft for deployment as scheduled is a factor which has a bearing on this accident.

2. Specific actions taken by this command to correct the discrepancies noted by the board as follows:



After flameout the pilot successfully ejected at less than 400'; his F8U continued on flight path for about 1250' before impact with the ground.

a. The squadron procedures previously utilized for checking work accomplished on squadron aircraft was satisfactory; and sufficient supervision was being carried out; however, it is now apparent that a more direct method must be established. Therefore, the aircraft maintenance section is being reorganized to provide for four senior noncommissioned officers who will act as final inspectors on all work accomplished on squadron aircraft. The inspectors will report the results of their inspections directly to the aircraft maintenance officer or the engines and airframes officer who will spot check all work prior to releasing the aircraft for flight.

b. A field grade officer outside the aircraft maintenance section will be assigned to audit the aircraft log books, work orders, and yellow sheets throughout the month to insure that squadron doctrine is being followed.

c. The executive officer of this organization will preside over a weekly meeting attended by the enlisted maintenance supervisory personnel, the flight safety officer, the ground safety officer, and all officers in the aircraft maintenance section in order to provide closer coordination, better supervision, and a continuing interchange of ideas.

Group Endorsement.

1. Forwarded concurring in the report and the first endorsement.

2. It is encouraging to note that although an error in the IPB was listed as a factor in this accident, the squadron realized that had their own established maintenance procedures been followed this accident would not have happened.

3. This Group's policy regarding a flameout in the F8U-1/1P is stated in part as follows: "If an airstart is unsuccessful the pilot will abandon the aircraft at sufficient altitude so as to effect a safe bailout procedure." It is impractical to establish hard altitudes which are applicable to all situations and below which no airstarts will be attempted. However, should a flameout occur in the traffic pattern, altitude, aircraft configuration, engine acceleration time, and sink rate do not permit the pilot to do more than turn the aircraft away from populated areas and eject. This Group's order concerning a flameout in the F8U-1/1P will be changed to reflect this procedure.

Wing Endorsement.

1. Forwarded concurring in the report and in the comments of the first and second endorsements.

2. It is unfortunate that the previous pilot did not make a "yellow sheet" entry regarding the F8U-1 fuel quantity gage. Such an entry possibly would have generated maintenance corrective action. In addition to the corrective action indicated in first endorsement, this headquarters has reiterated to subordinate units the need for a most thorough approach by each pilot relative to the reporting of possible maintenance discrepancies.

3. If the aircraft had not been equipped with a low-level ejection system (ASC 131), it is highly unlikely that the pilot would have survived. Within the capabilities of this command, attempts are being made to expedite receipt and installation on low-level ejection systems for all models of high-performance aircraft not so equipped.

...a good Joe?

Some organizations have accepted the practice of "living with maintenance discrepancies" as a way of life. Oftentimes, the dangers involved come to light only after it's too late.

THE adjective "recurring," describing maintenance discrepancies, was probably not heard in the pioneer era of aviation.

A pressing problem of today, not a pleasant one to discuss, is the practice of "living with maintenance discrepancies." Allowing aircraft discrepancies to go unreported, or for write-ups to recur over a long period, is certainly inviting trouble. Yet some organizations have accepted these practices as a way of life. They come to light in investigations of aircraft accidents, incidents and in operational safety surveys.

Both aircrew members and maintenance men are guilty of perpetuating this practice. Initially of course, it stems from poor organizational management and supervision, and constitutes a breakdown of accepted maintenance and operational standards.

The practice is usually an expediency on the part of pilots and maintenance men to meet operational deadlines — an effort to make their tasks easier. Pilots begin accepting aircraft with minor deficiences in order to "get the show on the road," and maintenance continues to furnish more of the same. And so the standards deteriorate.

Pilots have been known to skip writing up an aircraft discrepancy because they weren't sure what was wrong and didn't want to bother the crew chief with extra work. A sympathetic attitude, to be sure, but one not to be condoned because of the danger inherent.

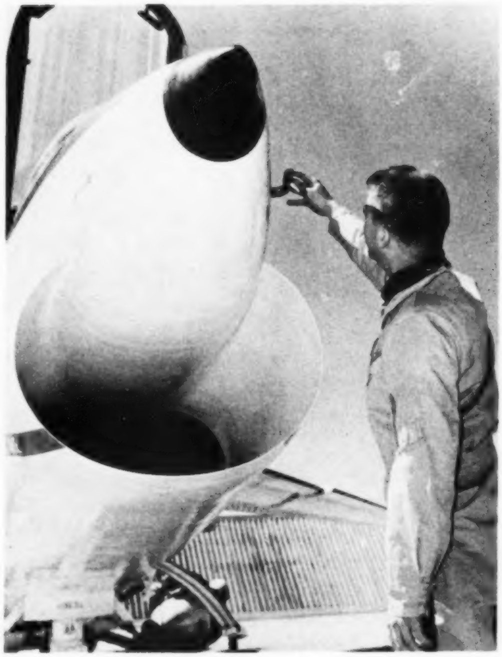
This buddy-buddy attitude is then adopted by maintenance men who discover deficiencies and don't record them, but inform the pilot of their existence with the promise of fixing them. The pilot in his mistaken desire to be a "good Joe" thanks the mechanic for the info and accepts the aircraft.

They have worked together—to downgrade quality and destroy mutual respect. The maintenance man has succeeded in getting the pilot to accept a sub-standard machine—it will be even easier next time. A doubt has been planted in the pilot's mind. "How come a discrepancy that should have been detected on postflight was just found in the preflight? Wonder if every aircraft is short-changed on maintenance?"

There are instances on record in which maintenance men have talked aircrew members out of writing up a discrepancy for the unsound reason that it has happened before and wasn't considered serious. And many more instances in which pilots either did not write up known or suspected deficiencies, or did not take the trouble to make an intelligent entry to be acted on. These deviations do not "help" anybody in the long run.—*From USAF "Maintenance Review"*

Pitot-Static Tube Care

Piping in the Wind



Large errors in altitude and airspeed indications are likely to result from distorted or partially clogged static or pitot openings. Errors in excess of 100 feet in altitude and 10 knots in airspeed may be experienced. Clogging of the drain holes of pitot or pitot-static tubes may also cause erroneous indications by permitting water to accumulate which may flow into the connecting lines. Subsequent freezing may cause the instruments to become inoperative.

In order that atmospheric pressure may be transmitted to the altimeter, airspeed indicator, and the rate-of-climb indicator, the air flow over the static openings must be smooth and undisturbed. Distortion or roughness of the surface adjacent to the static openings may cause local turbulence which will result in the transmission of a false pressure to the instruments. Partial clogging of the static openings may cause excessive lag in indication, since clogging restricts or slows down the airflow in the static lines during changes in altitude.

Some causes of clogged or distorted static vents, pitot tubes and pitot-static tubes are:

Presence of foreign materials such as insects, mud, grease, paint, and metal polish.

Damage (denting or bending) through careless location of work platforms or ladders by personnel working in the vicinity.

Damage by loose stones or debris thrown by the propeller or jet blast of other aircraft.

Pitot tubes and pitot-static tubes should be protected with suitable covers when airplanes are not in flight to prevent water, insects and other foreign materials from entering the pitot and static lines. Covers suitable for use on all pitot tubes and pitot-static tubes currently installed in Navy airplanes may be made locally in accordance with BuAer Inst NavAer 05.8.

If it becomes necessary to clean pitot tubes, pitot-static tubes or static vents on an airplane, use a cloth dampened with Dry-Cleaning Solvent, FSN 6850-285-8012 (Fed. Spec P-S-661). If further cleaning is necessary a liquid polishing agent with a minimum of solids in solution may be used. Take care to ensure that all holes are open and clean after the polishing operation.

Dents or undue roughness within a radius of 3 inches of the static vent holes, gaps between the leading edge of the static vent plate and the skin of the airplane, or clogging of any openings should be corrected by one or more of the following procedures:

(1) Carefully remove foreign materials from all openings.
(2) Remove dents in fuselage around vents.
(3) Refinish surface around vent plate.
(4) Replace damaged static vent.
(5) Replace damaged pitot or pitot-static tubes.

Inspection of the pitot-static tube or the pitot tube and static vents should be made at frequent intervals as required by local operating conditions. It is preferable that this inspection be made prior to each flight.

BEWARE OF PROPELLERS—This ground accident involving an SNB-5 occurred at night during the final stages of a major inspection. The cockpit was manned by a qualified plane captain. An experienced instrument technician, had completed the final adjustments to the aircraft vacuum system and was attempting to clear the aircraft while both engines were idling at 700 rpm. The technician moved from the inboard (left) side of the starboard engine, under the fuselage to the inboard (right) side of the port engine.

The aircraft navigation lights were ON during the time the engines were running. An NC-5 auxiliary power unit was parked, with headlights and spotlights ON, approximately 20 feet in front of the port wingtip, facing diagonally toward the starboard engine.

A senior petty officer was standing approximately 20 feet in front of, and facing toward the port engine in order to supervise both the technician and the plane captain. He remained in this position during the entire time the engines were running. When the senior PO noticed that the technician was moving forward toward the moving propeller he attempted to warn him by gestures and by voice. The technician evidently did not see or hear the warning and proceeded, head down, into the path of the rotating port propeller. He was fatally injured. There were no obstacles adrift on the ramp and the concrete was dry.

The procedure used here to set the suction relief valve was not in accordance with the procedures outlined in the Handbook of Maintenance Instructions. The HMI prescribes that the adjustment of the suction relief valve be made with only one engine running at a time. The procedure in the HMI is the safest method.

While making a vacuum system adjustment on the Beech during a night run-up the mechanic moved into a turning prop.

FOOL CONTAMINATION—In discussing the common contaminants, the main concern is with corrosion products, sand and the products of pump wear. Here are a few more contaminants that sometimes escape detection until the trouble appears: metal chips from machining, tiny slices of O-rings, lint, core sand in blind casting passages, salt, lead shot, gold fillings, bird feathers, chewing gum wrappers and old cigar butts. It is believed that the major source of this trouble comes from the airframe fuel tank and certain fuel system components, placing a considerable hardship on the engine manufacturer.

Sabotage? Probably not. Some people are just naturally careless, which simply means that we must maintain a continuous education effort to encourage cleanliness in work habits, and back this effort with all the foolproof quality controls that can reasonably be implemented.

—Allison Division of GM

PREFLIGHT PRECAUTION—The F3H was rendezvousing with his leader at 2000 feet after catapult and as the aircraft was accelerating through 280 knots IAS, the port radar access door opened and was torn off the aircraft by the wind blast. The pilot climbed to 10,000 feet, dumped wing fuel and checked the stall characteristics of the aircraft. All controls functioned normally and a normal recovery was made without further incident.

The cause of the occurrence was a possible failure to secure the forward latch of the radar access door before flight. The aft latch receptacle was torn from the aircraft indicating that it was secured. The forward latch receptacle remained intact. The pilot's statement bears out the fact that he did perform a thorough preflight inspection, prior to entering the cockpit, and the door was secured. This access door is a latch, dzus combination, but the latch handle will dzus down properly without full engagement of the inner locking levers. The doors are close fitted and look in place without the latch secured. With only one latch secured the door will pass a normal preflight inspection.

During carrier based operations, the difficulty and uncertainty of ensuring positive engagement of the inner locking lever, prior to securing the external latch and dzus fastener, presents a serious problem for the following reasons:

a. Two hands are required to ensure simultaneous engagement of the two inner locking levers while closing the door.

b. Most radar maintenance must be performed on the flight deck during hours of darkness, and

it is difficult to visually insure that the inner locking levers are fully engaged.

c. Since the latches are approximately 8 feet above the deck, most men must use a step ladder to effectively perform the task.

Carrier operations often require that preflight and maintenance inspections be performed under adverse conditions. When it is recognized that a particular fitting is difficult to fasten, extra attention must be taken to ensure its closure both during maintenance periods and on preflight inspections by pilots.

RED TAGS DO MEAN SOMETHING!—Maintenance personnel had been working on an F3H refrigeration turbine, which is located in the forward equipment bay of that model aircraft. The refrigeration turbine has an outlet composed of ducting and fiber glass covered corrugated hose which terminated in the starboard air inlet duct.

The hose is normally secured to the ducting by two large clamps of the Whittick or Marman variety. In this particular case, someone had disconnected the hose from the ducting, leaving one clamp hanging loosely on the ducting, and the other clamp around the free upstream end of the hose. A red tag had been attached to the cockpit control stick warning of this condition, and stating that the engine should not be operated. However, a pilot and crew on second shift elected to run the engine.

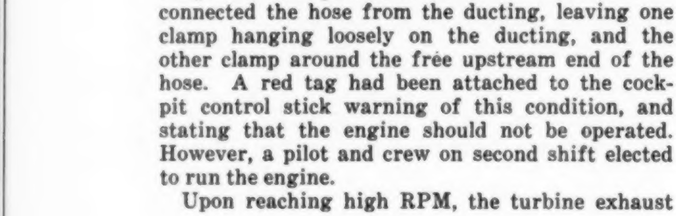
Upon reaching high RPM, the turbine exhaust hose, which was disconnected at the upstream end, apparently was drawn by negative pressure, or forced by ram air into the starboard inlet duct. The clamp which was loosely hanging to the free end of the hose was pulled or forced through the refrigeration turbine exhaust duct, through the outlet into the starboard air inlet duct, and thence into the engine. Result—Foreign object damage.

Red tags are installed in the cockpit to prevent this type incident. All personnel concerned with aircraft engine turn-up, must conduct a thorough preturn-up check, insuring that discrepancies pertaining to the engine and related systems that depend upon engine operation have been properly corrected. Check for the presence of warning tags on the aircraft or in the cockpit, and abide by the warning thereon.

A related article "Foreign Objects Identified" appears in APPROACH magazine, the November 1959 issue. This article lists identified foreign objects which have caused damage to turbo-jet engines. This article is recommended reading for all personnel associated with turbo-jet aircraft operation.

JAM UP—In order to inspect the elevator hinges of all the squadron JD-1s, night check removed all elevators. One aircraft was found to be in satisfactory condition and was reassembled that night. The next day this plane flew in instrument conditions to a distant field.

This flight was uneventful. The JD-1 was secured for the night and the next morning, during



MOBILE WORKSTAND—Tractor was being used as a work-stand by ground crew in order to add oil to tail rotor transmission. Tractor driver inadvertently released parking brake by brushing against it with his leg, allowing tractor to roll slowly into tail cone of helicopter.

This tractor was being used in an authorized manner and normal care was taken in positioning it for its use in this manner. (Note that a non-skid work platform is provided on the tractor for use as a work platform.)

The parking brake on this tractor is set by an over-the-top cam action and requires extremely little pressure to release it. The fluid drive coupling has no "park" position.

It is recommended that:

1. All qualified tractor drivers be cautioned again regarding these features of this type tractor (see "Tractor Troubles," Jan '60 APPROACH).

2. Future tractor designs incorporate a positive lock on the parking brake.

preflight inspection and run-up, the controls locked in the full up position. It was found that a pair of duck billed pliers had vibrated out of the horizontal stabilizer and were lodged between the stabilizer and elevator.

The pilot was a 6-foot 2 individual of 200 pounds and he was unable to budge the controls. No damage was done as this happened on the deck. No telling what might have happened had the pliers jammed the controls during flight.

JACK PAD LACK—In order to permit replacement of the port main wheel brake assembly the F11F-1 aircraft was jacked at the port main landing gear jack point. Due to the position of the jack, two of the center flange mounting bolts were rendered inaccessible for torquing. As wing jack pads were not available, maintenance personnel proceeded to jack the aircraft by inserting a jacking adapter into the axle causing the axle to split at the milled keyway. This damage necessitated a complete main landing gear change.

Maintenance personnel were instructed to refrain from using this type jacking procedure and proper equipment was ordered.

MIXED BRAKE LININGS—Prior to 180-degree position in landing pattern, an A4D pilot checked brakes and noted complete absence of right brake pressure. He notified the tower and made a normal landing, engaging field arresting gear at approximately 70 knots. On the hop immediately prior to this the brakes worked normally both on taxiing and landing.

Investigation revealed improper brake linings (pucks) had been installed. ASC 138 requires installation of thin brake linings part No. 9520641 and thick brake discs part No. 9530633 in addition to replacement of the piston assemblies part number 9510477. Rework kits—Goodyear part No. 9524308 were not available at the time for incorporation of this service change. However, the thin brake linings were made available with the information that the thin linings were interchangeable with thick brake linings part No. 9521107, currently in use with brake assembly part No. 9531231. In this occurrence, both types of brake linings were intermixed on the same side of the brake assembly, allowing the thin linings installed on the outboard side of the brake disc to fall free. The thick linings remaining on the outboard side of the brake disc were destroyed at some time prior to the loss of brake pressure as evidenced by particles of lining found in the brake assembly. The piston assemblies depressed completely, causing the loss of brake pressure. No leaks or other discrepancies were discovered in the brake system.

The information that both types of brake linings can be used concurrently is erroneous. In the case where both types of lining must be installed on one brake assembly, it is imperative that all the linings on a single side of the brake disc be of the same type.

Interchangeability is not necessarily compatibility. Whenever a consumer is told by a merchant that the specific product he seeks is not in stock but "we have another that is just as good" the alert consumer becomes suspicious. The same attitude should prevail in aircraft parts procurement.

Squadron maintenance personnel should be instructed concerning intermixing both types of brake linings.

COORDINATION NEED—Before performing a pre-oil engine check a walk around inspection of the AD was made by the pilot prior to start. After start the pilot remained in chocks for approximately four minutes, and proceeded to taxi to clear area for power turn-up. The pilot was given a "spread wings" signal and actuated wing lever. As the wings were spreading the pilot heard a loud cracking sound from the starboard wing.

Investigation revealed starboard wing had spread over the gun feed mechanism causing damage which involved 275 direct manhours to repair. The pilot failed to notice the feed mechanism on top of the wing, because of the darkness, in his inspection prior to starting.

The ordnanceman had placed the feed mechanism on the wing while installing a new 20mm starboard inboard gun in the aircraft. Just prior to secure and before completing the job the ordnanceman was called away from the gun installation to replace the armor plating on this and another aircraft. Since the plane was in a down status and assuming that it would remain so overnight and that he could complete the gun installation the following morning, the ordnanceman did not complete the gun installation that afternoon, nor did the ordnance shop inform the maintenance department of the unfinished gun installation.

Corrective action has been instigated to insure that in the future, prior to commencing work on any aircraft requiring maintenance, the maintenance chief will be notified and will prepare a work sheet downing the aircraft until this work has been completed and signed off.

Cocked Cases Cause Bearing Failures

Findings, conclusions, and recommendations from selected engine Disassembly and Inspection Reports.

J48-P8: *Findings:* Engine was returned to overhaul for blistered inducers. Disassembly revealed brinelling of front main bearing (Part No. 203059) rollers and races.

Conclusions: It was concluded that damage to the front main bearing was caused by cocking the single unit accessory case and front air intake case during installation after a front inducer inspection. Cocking caused the bearing rollers to gouge the front main bearing journal. This condition will cause possible vibration and/or bearing failure.

Recommendation: It is recommended that operating and supporting activities concerned with the J48 engine be alerted to use utmost caution during reinstallation of the single unit accessory case and front air intake case to prevent cocking of the front main bearing.

Additional reports indicate this error is likely to recur as a result of frequent inducer inspections. —Ed.

J48-A7012 Fuel Control *Findings:* Fuel control was returned to overhaul activity due to an unstable surging condition. Investigation revealed the maximum stop screw set at 82° which prevented the throttle lever from reaching the flat spot of the cam which is from 84° to 90°. At 82° throttle angle the control was found to be governing too early and flowing lean causing a 3 to 8% surge at 75 to 98% rpm.

Conclusions: Bench test revealed basic fuel control was satisfactory. It was concluded that the linkage adjustments had not been performed.

Recommendations: Whenever a fuel control, gear box, or pressurizing and shut-off valve is replaced on an engine check, it is recommended that the linkage adjustments be made in accordance with the HMI AN 02B-10ACC-2 Section II, paragraph 2-238, 2-239, and 2-260.

R3350-26WC *Findings:* This engine was received with no known reason for removal listed in the engine log book. A squadron message was received that referred to URGENT AMPFUR NO. 2 (which was not received by the overhaul investigating personnel). The message indicated moderate overboost. No discrepancies were found that could have caused the overboost and no damage was found to have resulted from the overboost condition. Although the engine had 218 hours since overhaul, an old AMPFUR was attached to the engine log indicating that metal was found in the sump at 25.7 hours since overhaul. There was no evidence of metal contamination of any section of the engine or oil strainers.

Conclusions: There was no internal engine part failure or damage which would justify the premature removal of this engine.

Recommendations: It is recommended that when an engine is prematurely removed due to suspected internal part failure, complete and accurate information concerning reason for removal together with samples of metal found in the oil system be forwarded to the overhaul activity with the engine and engine log. This type of information is necessary to accurately evaluate the engine performance and to aid in determining the cause of failure.

R3350-34 *Findings:* The piston pin retaining plug Part No. 117692 for the No. 12 cylinder assembly had been improperly installed with resultant severe damage to the No. 12 piston Part No. 136377 and the retaining plug.

Conclusions: Failure of the piston pin retaining plug and the subsequent damage to the related parts of this cylinder assembly was due to improper installation of the piston pin and retaining plug at the time of cylinder replacement. This engine had only 2 hours of operation recorded since the cylinder change.

Recommendations: Refer to the Handbook of Service Instructions for the proper procedure for piston and piston pin installation.

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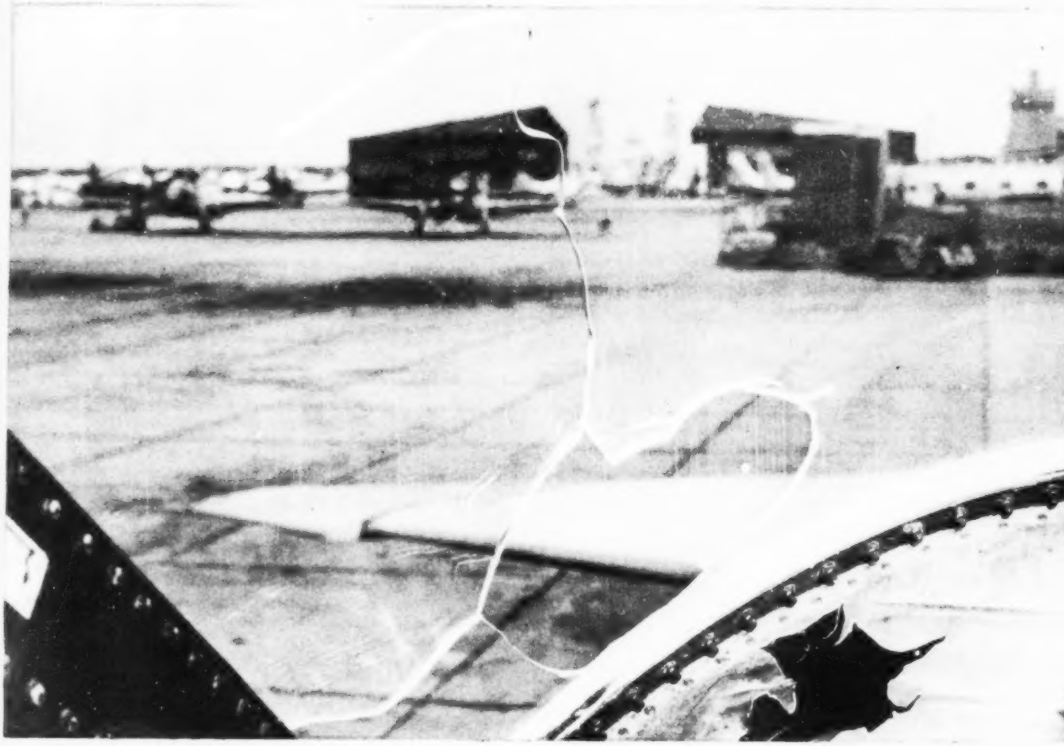
*** If an aircraft part can be installed incorrectly, someone will install it that way!**



AN ordnance crew upon de-arming the seat of an F8U-1 failed to check the actual position of the safety pin. They checked the pin and red flag for position, but failed to note that the pin was around the firing mechanism instead of through the hole provided. In unhooking the connecting cable leading from the face curtain drum to the jack shaft pulley the initiator fired. Firing mechanism and canopy actuator fired through the canopy.

A ferry pilot, in attempting to place canopy safety pin in position, had put the pin around initiator head instead of through the safety pin hole.

The board recommended that personnel working with this equipment make a detailed inspection of all safety devices prior to starting maintenance work, and that personnel installing safety devices insure that they are properly installed.

CLIPBOARD

Did You Know

THAT prior to shooting an approach at night when the ceiling and visibility are at minimum, it is to your advantage to request that the high intensity runway lights be turned up to strength five during your approach, and that the lights be turned down to strength two, to avoid glare, when the tower operator can see your landing lights as you are breaking contact? In the daytime, under the same instrument conditions as above, request that the lights be turned to strength five and kept on that intensity throughout the landing. This daytime procedure will avoid the possibility of any cockpit confusion as to "where is the duty runway" when breaking contact.—*VR-1*

Rescue Points

TO REDUCE the possibility of igniting fuel on the surface of the water when marking the location of a water crash, it is recommended that personnel use only dye marker in the daylight and sealed electric float lights at night.

Known inadvertent ignitions have happened in the following manner:

(a) dropping a smoke pot into the area,

(b) ignition of a flare or smoke light by the downed airman,

(c) Very star contacting the surface where gasoline was present,

(d) torching from the exhaust of a crash boat.

An unusual cause of ignition was a static electrical charge from a helicopter when the sling was lowered into the water.

When in a fuel-covered area crash boats should use only low power. Dropping the helicopter sling into the water prior to entering fuel-covered areas will discharge the static electricity. —*Adapted from CNATra Inst 3750.10A.*

PRO-cedure

"IT IS NOT enough for the pilot to be satisfied in his own mind that no person is actually endangered; he must take definite and particular pains to satisfy himself that he is flying in such a manner that no person could reasonably think that he or his property is endangered." —*OpNavInst 3710.6A*

Aerodynamic Drag

MAINTENANCE is doing everything possible to impress its people with the importance of keeping the 707's aerodynamically clean. Dents, airplane cleanliness, sealing material, all play a role in this field. To illustrate, the drag from an item such as a dent in the engine cowl depends upon the airspeed squared. The drag produced by a dent at 200 knots will be approximately six times as great at an airspeed of 500 knots and twelve times as great at an airspeed of 700 knots. The increased drag results in a proportional increase in thrust requirements thus increasing fuel consumption and decreasing range.—*TWA "Flite Facts."*

Radio Discipline

SAW a fellow the other day walking around with a fat lip. Asked him, "What happened?" His answer, "Talking when I should have been listening." Reminded me of some pilot's radio discipline or lack of same. They get in the airplane and immediately start transmitting for a radio check without even checking their receiver. So how can they get a radio check if their receiver is not on the right frequency, or the volume is down or if the receiver is out completely. So let's start listening before talking, so we won't be acting like "Fat Heads."

False Cone Indications

ACCORDING to a communique from the FAA, during recent flight tests on some VOR stations, VOR receivers were found susceptible to partial false cone indications at distances up to 8 miles from the station. This was evidenced by oscillation of the FPDI needles and occasionally by some minor flag-warning activity. The TO-FROM pointer, however, did not fluctuate.

In view of this, it is important to continue to use the TO-FROM pointer as the primary indication of station passage. The FAA, by the way, has no information concerning the altitudes associated with the distances from the VOR stations that prompted these false indications.

If you experience a false cone indication, report the details to maintenance office and also note it in the aircraft logbook.—*Flight Safety Foundation*

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EMERGENCY LANDINGS

LT JOHN R. KEMBLE, VA-55—Lt. Kemble was informed that the port tire and wheel had exploded during the catapulting of his FJ-4B. He diverted to NAS Barbers Point and requested a foam strip to be laid. Lt. Kemble did not allow the broken brake discs on the port strut to contact the runway until the aircraft reached the foam and just prior to arrestment. The aircraft was up and back aboard the carrier the following day.

Well Done!

LT S. C. WOOD, VS-31—The nose wheel on his S2F jammed in the intermediate position and could not be moved. Lt. Wood diverted to Leeward Point for an emergency night landing. The landing was made on the main gear and the nose was held off the runway while the props were feathered and aligned using the starter. Damage was confined to the nose wheel doors.

LTJG JOSEPH E. CLARK, VR-24—The pilot tried every conceivable method to get the nose gear on his FJ-3M to extend and lock, including a bounce landing on the main mounts. When all attempts failed, Lt(jg) Clark asked Port Lyautey tower to have foam laid on the runway. The nose was held up and did not settle into the foam until arrestment was complete. Aircraft damage was minor.

LTJG GREGORY L. DAVISON, VA-126—The starboard wheel on the FJ-4B blew up during normal touchdown on an MLP pass. While the aircraft circled the field, the Miramar crash crew applied foam to the runway. Lt(jg) Davison landed on the port wheel followed by arrestment in the foamed area. The aircraft was undamaged during landing.

LCDR JESSE W. TAFT, VAH-5—He landed an A3D minus the port wheel at night at a strange field (Rome) in poor weather (see "Roman Holiday," page 36).

KNOW
YOUR AIRPLANE

KNOW
YOUR EQUIPMENT

KNOW
YOURSELF

ALL HAVE THEIR LIMITATIONS... DO YOU KNOW THEM?